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SPACE VOYAGER

PATRICK MOORE CONSULTANT EDITOR

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Exclusive artwork from the fertile imagination and dexterous fingers of Adrian Mann. Back cover: Scene from the fantasy dance movie, The Last Dragon *–see Viewscreen, page 38.*

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CAPTAIN'S LOG

Those of you who never bother to read the masthead on page 3 (and let's face it, who does?) might like to turn back and have a quick look. Don't worry, the rest of us will wait. . .

Done it? As you will have noticed, there's . . . hmmmm . . . been a few changes around these parts. Wendy Graham and Chris Richmond have moved on to pastures new (although I'm sure you'll be seeing their work appearing in **Space Voyager** from time to time) and you've been lumbered with me, like it or not, as your new editor.

My background, you may be interested to know, is mainly of a technical nature working in the motoring and motor racing field, but I've also contributed for several years to various film, video and TV journals, and I share with you all an interest in space exploration, science and new technology. And I went to the same school as Sir Isaac Newton! It's true I tell you!

While that might serve as an introduction, in many ways it's totally irrelevant because it's what we're going to do with **Space Voyager** in the future that matters. There are changes planned in that department as well.

So many editors are in the dark when they take over a magazine as to which direction that magazine should be heading in. I'm lucky to reap the benefits of the reader survey that was conducted in issue 15 and revealed many interesting facts about **Space Voyager's** readers and what you want to see included within its pages. Thanks to all of you who took the time to return the questionnaire – believe it or not, we do take notice of your thoughts and ideas, and it was nice to see that many of them mirrored my own opinions as to where this magazine should be going.

A major criticism from the survey was that **Space Voyager** lacked direction and was trying to be all things to all men. That's not necessarily a bad thing, of course, if it can be achieved successfully, but few, if any magazines, have ever done so. There's no doubt that certain areas need to be tightened up and built upon while others should, perhaps, be allowed to die a natural death. Let's take a look at some of the points that you raised:

There was an overwhelming response for more science-fiction short stories. As the magazine hasn't featured any for over a year, that shouldn't be difficult. Hopefully, as from the next issue, this will become a regular feature of **Space Voyager.** We'll be commissioning new writers to provide short stories and will also welcome work by readers – indeed, that is true for any articles, not just short stories. But, we will be very critical and need good original material, not just rehashes of old Asimov or whatever.

Science fact was another popular area and this will become increasingly important over the coming months. We'll endeavour to present it in an interesting and readable fashion so that you don't need to be a doctor of physics to get something out of it.

Not so popular were areas such as modelling. This doesn't mean that we won't be covering it in the future but it will be played down and our coverage will lean more towards replicas of authentic space hardware rather than fantasy figures and the like. It's up to you to respond and tell us if we're wrong.

Conventions was another area that apparently holds little interest. The tone of the survey seemed to indicate that, while many of you are interested in *Star Trek* and so on, few of you have the time or the money to travel long distances to attend conventions, nor the desire to slip on a pair of pointed ears and pretend to be you know who. Am I wrong? So vaporise me. . .

There'll be plenty of new stuff as well, indeed several new areas that you might not have associated with **Space Voyager** in the past, but always interesting, informative, thought provoking and often controversial. We've certainly got the best contributors in the business to make sure it is.

But remember, please, please, write and let us know what you think of **Space Voyager** and the world of science in general. If your letter is constructive (be it favourable or not) we'll probably print it; if it's totally negative and boring, we almost certainly won't. But please respond. This is your magazine and, like they say at election time, if you don't vote, don't complain.

Technical Hitch

Right, down to business. My first duty is to apologise for the fact that this issue has been affected to a certain degree by the changeover between myself and Wendy Graham. Certain features that were included in issue 16's Next Issue column have had to be held over, others have been dropped altogether.

At this point I should perhaps respond to criticism aimed at the Next Issue panel by several readers who complain that planned features sometimes haven't appeared. Most magazines face this problem to a certain degree but for a bi-monthly it's particularly apparent. Each issue has to be finished more than three months before the next one appears; a lot can happen in three months, and it's not all bad!

In the scientific industry, changes can happen rapidly and it will often be the case that certain features are shelved because an even better one has come to light. We must always endeavour to provide the best material available for a given issue. The Next Issue panel will be as accurate as we can possibly make it but is always subject to alteration and revision.

Caption competition

And to bring my first editorial to a close we have, as per usual, the caption competition with a year's subscription to **Space Voyager** up for grabs.

The still in issue 15 showed Paul Atreides leading the legion of Fremen from *Dune* over the sand into battle. No originality points to the hordes of entries which suggested a caption along the lines of 'Last one in's a sissy/wally, and other less savoury terms. Most original, to my mind, was **Martin Wilson** from Dewsbury, West Yorkshire, who suggested 'I'm not so sure that an Arrakeen Marathon is such a good way of raising funds.'

Well done, Martin – your money can stay in your pocket for a whole year. This issue's caption photo is taken from the latest Bond blockbuster *A View To A Kill* (reviewed in this month's Viewscreen column) and shows May Day (Grace Jones) hoisting aloft KGB Klotkoff (Bogdan Kominowski).

What is he or she saying or thinking? The most original and amusing suggestion to reach us by 1 November will win a year's subscription to **Space Voyager.** Keep 'em clean. Well . . . cleanish.

DATA BANK

EVENTS

1985

Aug 23-26 Enterprise 1 Star Trek, Liverpool. Guests: James Doohan, John Shackley, Write: Sharon Rowe, 24 Haywards Close, Clevedon, Avon.

Aug 23-26 Leasurehive 2 Dr Who, Swindon. Write: Tony Cherrington, 2 Domestic Quarters, Bryanston School, Blandford, Dorset DT11 0PX.

Sept 6-8 Fantasycon X, Fantasy, Birmingham. MC: Charles L Grant. Write: S Jones/Jo Fletcher, 130 Park View, Wembley, Middlesex HA9 6JU.

Sept 13-15 Camcon (Unicon 6) SF, Cambridge. Write N Taylor, c/o Perspective Design Ltd, 9 Pembroke Street, Cambridge, CB2 3QY.

Sept 28-29 Games Day '85 Sci-Fi/Fantasy, London. Festival of indoor games and live combat from Treasure Trap, Horticultural Hall, Greycoat Street, London.

Oct 11-13 Midcon '85 Star Trek, Leicester. Write: Terry Elson, 8 Ennerdale Close, Oadby, Leicester ,LE2 4TN.

Oct 19 Birmingham Comic Film & Fantasty Mart. Methodist Central Hall, Corportion Street, Birmingham.

Oct 26-27 Beneluxcon '85 SF, Leiden, The Netherlands. Guest: AnneMarie van Ewyck. Write: Roelof Goudriaan, Postbus 1189, 8200 BD Lelystad, The Netherlands.

Nov 1-3 Novacon 15 SF, Coventry. Guests: Dave Langford, James White. Write: Graham Poole, 86 Berwood Farm Road, Wylde Green, Sutton Coldfield, West Midlands, B72 1AG.

Nov 1-3 Cymrucon '85 SF, Cardiff. Write: Neil Burgess, 99 Coed Edeyrn, Llanedeyrn, Cardiff, Wales.

Dec 14 Birmingham Comic Film & Fantasy Mart As Oct 19.

1986

Feb 7-9 Mexicon 2 SF, Birmingham. Write: Mexicon 2, 24a Beech Road, London, N11.

March 28-31 Albacon III SF, Glasgow. Write: Albacon III, 80 Hillingdon Gardens, Glasgow, G52 2TP.

May 2-5 UFP Con '86 Star Trek, Birmingham. Guest: David Gerold. Write: Kim Knight 30 Woodcote House, Queen Street, Hitchin, Herts.

July 10-13 Ballcon SF, Zagreb, Yugoslavia. Write: Ballcon, c/o SFera, Ivanićgradska 41 A, 41000 Zagreb, Yugoslavia.

Aug 22-25 Galileo Con '86 Star Trek, Newcastle. Write: Catherine Richardson, 30 Kirkdale Green, Rye Hill Estate, Newcastle upon Tyne, NE4 6HU.

Aug 28-Sept 1 Confederation 44 World SF Con Atlanta USA. Guests: Ray Bradbury, Terry Carr, Bob Shaw. Write: Confederation, 2500 N Atlanta Street, Symyrna, Georgia 30080, USA.

Oct 11-12 Terracon '86 Star Trek, Leeds. Write: Keith Jackson, 27 Lansdowne Avenue, Glasshoughton, Castleford, West Yorkshire, WF10 4DA.

Dec 5-7 Santacon '86 Media, York. Write: Santacon '86, 84 Ambrose Street, Fulford Road, York.

Competition winners

Lots of prizes to give away in issue 15, but not too many entries for some strange reason. Perhaps it's because you had to do a bit of work for a change in the Ghastly competition. There were only 10 favourite quotations submitted for the 20 prize copies of Neil Gaiman and Kim Newman's *Ghastly Beyond Belief* SF quotation book. Ah well, not much competition for this bunch then, who will each receive a copy:

MG Windell from Rickmansworth; **AP Bellerby** from Otley; **Capt JM Gunns** from BFPO 825; **Phil Taylor** from Cheshire; **Michael Crouch** from Norwich; **John Gorman** from Stoke-on-Trent; **Nicky Brett** from Swindon; **Stephen Hickmott** from Gosport; **Leah Turner** from Goole; and **Martin Wilson** from Dewsbury (who also won the caption competition. . .God helps those who help themselves).

Our second competition was for those who took the time to fill in the reader survey in issue 15. Thanks very much to all of you who did just that and came up with some excellent ideas for ways of improving **Space Voyager.** Some of thos suggestions will be put to good use in the very next issue.

There was a year's free subscription to **Space Voyager** to be won by the best three suggestions and, after a very difficult decision, the winners are:

Paul Green from Oldham; **GS Bishop** from St Helier on Jersey; and **Brian Turvey** from Flackwell Heath, Bucks.

As to what their suggestions were. . . well, we're keeping those to ourselves. Then we can pretend we thought of them first. We're not stupid, you know.

The magnificant seven

The film *Wargames* became all too real in July when seven American children, all aged under 18, were arrested for computer crimes involving fraud and, incredibly, national security.

Using their home computers, the magnificent seven had managed to tap into various mainframe systems, including Pentagon top security installations. It has been reported that this even allowed them to manoeuvre satellites in space! If it wasn't so frightening it would almost be funny.

Not suprisingly, the FBI and CIA became involved in what they suspected was a large scale computer fraud but were amazed to discover that the brains behind the operation were still in high school.

The full extent of the 'prank' has not yet come to light but it seems to follow lines very similar to those involved in the plot of *Wargames.* Thousands of dollars worth of goods were ordered using other people's credit cards, airline tickets were booked, exam results altered and so on. The parents of one of the seven were alarmed to receive a phone bill five times larger than normal; next month they received no bill at all because their offspring had got into the telephone company system!

The crimes only came to light when goods which had been ordered by credit card lay uncollected at a local post office and a local policeman, himself a computer buff, became suspicious.

The maximum punishment for such crimes in the USA is five years imprisonment but, because of their age and the sneaking admiration many Americans are voicing, it's unlikely that any of the seven will be going to prison.

Even if they did, no doubt they would simply tap into the prison's computer and arrange a slightly earlier parole date. . .

Wargames. ***What do they teach you kids at school these days. . ?***

DATA BANK

Ally Pally observatory

Arthur C Clarke (interviewed by Neil Gaiman on page 41) has given his support to plans for the building of an observatory at the Alexandra Palace in Wood Green, north London. The scheme involves mounting a telescope in the Palm Court, part of the palace's north-west pavilion which was severely damaged in the fire of July 1980.

Arthur C Clarke assured Alexandra Palace officials that it would be a perfect site for such a venture. 'It is undoubtedly one of the finest positions for viewing stars in London,' he said, in a letter written during a visit to London to promote *2010* earlier this year.

Costs are expected to be in the region of £100,000 and will be met by money from the Palace Trust Fund as part of a total development of the area amounting to £34m. The £3000 telescope dome, however, will be paid for by Harringey Astronomical Society. Work on the building is expected to begin towards the end of this year.

Arthur C Clarke – support for observatory at Alexandra Palace.

Live Aid bonus

Duncan Lunan informs us that a collection for the Live Aid appeal at ALBACON '85, which included an all-night folk singing session(!), soon passed the £200 target set by organiser Gytha North and eventually raised £1043 to aid the starving in Ethiopia. A tremendous effort – well done you lot.

Duncan also informs us that ASTRA, the Association in Scotland to Research into Astronautics, ran a spaceflight programme of seven events at ALBACON, including lectures, panels, a film, and an extraterrestrial encounter simulation. This was so successful that ASTRA has been asked to run the spaceflight programme at next year's Eastercon (ALBACON III) in the Central Hotel, Glasgow.

Late Shuttle news

The Spacelab 2 mission was eventually launched on 29 July. About 5min after lift-off, a sensor indicated that Challenger's centre engine was overheating. The engine was shut down and the Shuttle had to execute an 'abort to orbit' manoeuvre. This left the spacecraft in a much lower orbit than planned.

NASA suspect that the problem was caused by a faulty sensor and not the engine itself, but they cannot be sure until Challenger is examined on the ground. A full report on the Spacelab 2 mission will appear in the next Shuttle Update.

FS4 Office-Bearers

Dr Graeme Duncan, former President of FS4 has been elected to a life Honorary Vice Chairmanship. He joins other Honoraries, Chairman Ben Bova, and Honorary Vice Chairmen David Atkinson MP (con Bournemouth East), George Robertson MP (lab Hamilton), Michael Marshall MP (con Arundel), and George Hay.

The new FS4 President is Mensa Space SIG member, Jim Voller, and **Space Voyager** contributor Aldo Rabaiotti has been re-elected Senior Vice President. The Vice Presidents are Chris Forrest – former General Secretary, and new Board Members Darren Sarll and Dave Girling. Huddersfield Branch Chairman Paul Koch is the new Treasurer and new Board Member Andy Matthewman, a maths and engineering student at Bristol, is the new General Secretary.

In Space Settlers, **Space Voyager** contributor Andy Nimmo has been re-elected President, and former Director John Tressine has been elected Vice President. The new Directors are FS4 Glasgow Branch Chairman Gordon Hundley, FS4 Coventry Branch Chairman Alan Steel, and FS4 London Branch Chairman Peter Jones. W Angus Lindsay, the FS4 Carlisle Branch Chairman is the new Treasurer and Phil Johnson, FS4's Notts Branch Chairman is the new General Secretary.

At the FS4 and Settlers' AGMs held at Albacon, a series of national meetings were planned to take place in Largs, London, Coventry, Bristol, next year's Eastercon, and Triple-S Con which was postponed from this July to next, and will now take place in Bristol from 4-6 July 1986. Details of those events are available from the FS4 General Secretary, see ad elsewhere in this issue.

BBC releases

BBC Video have released the special feature-length *Dr Who* story originally produced to celebrate the 20th anniversary of the series. Entitled *Doctor Who – The Five Doctors,* the 90min cassette brings together all five doctors, their companions and their arch enemies including a Dalek, a Yeti, a Raston Warrior, a troop of Cybermen and The Master. The Doctors are forced to play the deadly game of Rassilon in The Death Zone of Gallifrey and must discover the secret of the first Time Lord or be trapped in the Space/Time Vortex forever.

Also new from BBC Video is *The Bagthorpe Saga,* a fantasy drama which was originally shown as a children's series and has now been adapted for video. It follows the ecapades of an eccentric English family who are all brilliant at everything they do, except for Jack and his dog Zero. But their world is turned upside down when Jack discovers that he has a talent of his own – seeing into the future.

Both *The Five Doctors* and *The Bagthorpe Saga* are available now and cost £24.95.

Russian Holograms

There's still time to see the most spectacular exhibition of holograms ever shown in this country, if you're quick. *Treasures of the USSR* at the Trocadero in London runs until the end of September and displays some remarkable relics in hologram form from the Hermitage in Leningrad and the Museum of Historic Treasures of the Ukraine in Kiev.

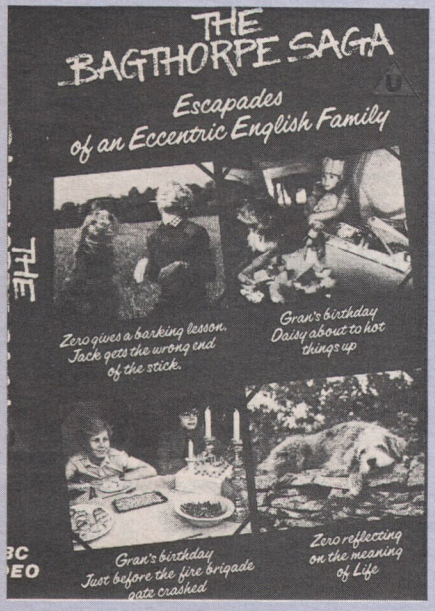
The exhibition has been put together by a British company, Light Fantastic, over a period of two years working in co-operation with the USSR Academy of Sciences.

Apart from more than 100 beautiful relics on display, visitors can discover how

DATA BANK

Soviet physicists and scientists are now using holography in such fields as medicine, data storage, dentistry, industry and space exploration. Soviet experts will be visiting many British universities and academic institutions while the exhibition is in progress.

Treasures of the USSR runs until 30 September at the Trocadero, Coventry Street, London. Admission is £1.75 for adults and £1.00 for children, students and senior citizens.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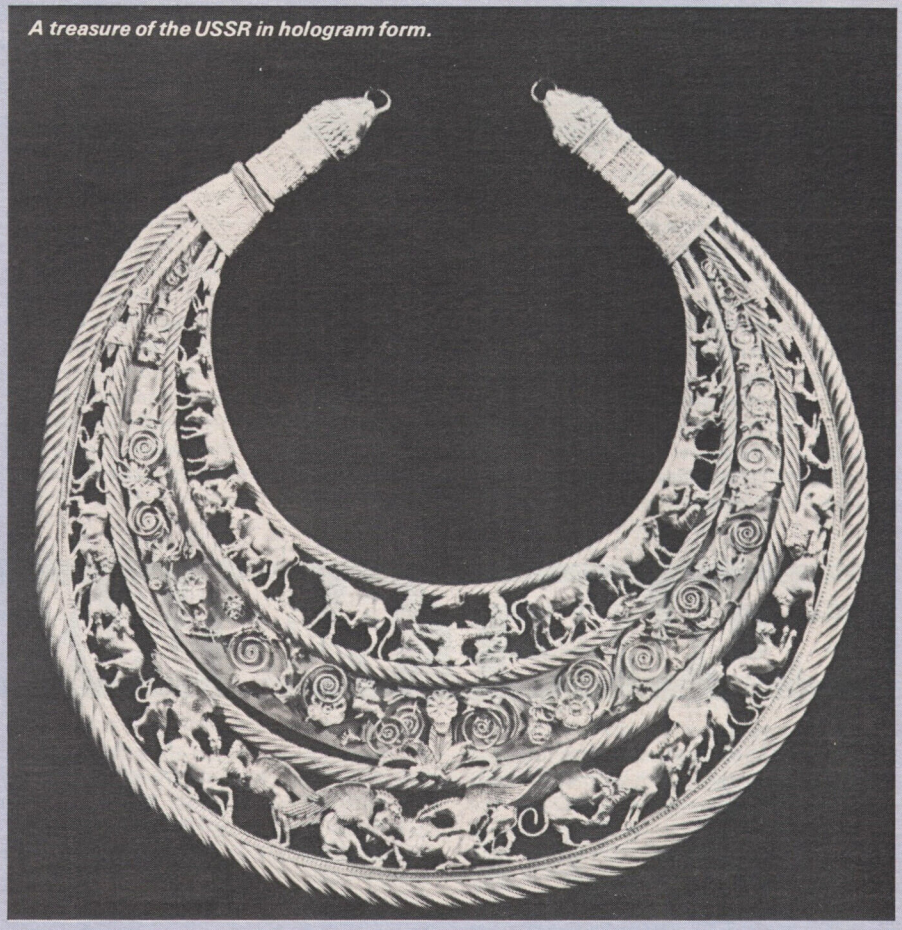
Gran's birthday Just before the fire brigade gate crashed
Zero reflecting on the meaning of Life


A treasure of the USSR in hologram form.

PROJECTIONS

Paul Klein looks forward to science fiction for the cinema and TV

One Hell of a movie?

Underworld is a first feature from Limehouse Productions, a low budget impression of a nightmare future world imagined by author Clive Barker, responsible for a series of popular SF paperbacks. A screenplay by James Kaplin from a Barker story involves subterranean mutants, psychopathic mobsters, a mad scientist, and a kidnapped damsel-in-distress. It sounds like a film set decades in the past and decades in the future at the same time: '40s *film noir* crossed with a 21st century vision of Hell raised on earth.

Denholm Elliot plays the barmy boffin, Steven Berkoff and Art Malik the hoodlums, with 17-year-old rising starlet Nicola Cowper as the girl. Shot in London and Ireland in January/February, *Underworld* should surface before the end of the year.

Meanwhile, in Germany. . .

Wolfgang Petersen, the Teutonic director behind a compelling TV series, *The Boat*, and a popular film fantasy, *The Neverending Story*, has just finished shooting *Enemy Mine*, the movie version of the short story by Barry Longyear.

Against a background of interplanetary war, Denis Quaid plays Davidge, a tough and unfeeling space pilot. Like all his colleagues Davidge loathes the alien enemy, the Dracs: he dismisses them as inferiors, mere 'toadfaces'. But when he crash-lands on a lifeless world, Davidge *meets* a Drac (played by black actor Lou Gossett Jnr) for the first time, and slowly realises that even though they are the enemy, the alien 'monsters' are in fact sensitive and civilised creatures.

In short, *Enemy Mine* is a futuristic fable about the present-day dangers of mutual Cold War fear and distrust. Technically a British film, *Enemy Mine* is costing more than 25m to make. Let's hope the effects don't submerge the message.

Back in Britain, the mind Biggles . . .

'Biggles clenched his teeth and pressed the firing button. The Sopwith's twin machine guns chattered out their stream of death. Plumes of smoke billowed from . . .'

Hold on a minute! I hear you cry. What is Biggles, the Great War fighter ace, doing in **Space Voyager**, the magazine of the future? The answer, I'm afraid, is a depressing one: namely a time-warp – a script device into which many millions of dollars have disappeared over the years – remember *The Final Countdown?*

Biggles is being made for the big screen, but not, it seems to me, without the interference of the fainthearts who felt the old fashioned fly-boy had to be brought up to date. Mind you, the producers are keeping mum as to how 1917 and 1985 come together: maybe they've come up with something 'absolutely wizard!' as Biggles would put it.

Biggles, a £7m flight of fancy, is scheduled for a November release.

NASA NEWS

New astronauts selected

NASA has selected its 11th group of astronauts, bringing the total number of full-time NASA astronauts to over 100. This does not include payload specialists who are not regarded as professional astronauts.

The new group includes six pilots and seven mission specialists. In order to qualify, pilots have to have a degree in engineering, physical or biological science or mathematics. They must have had at least 1000 hours flying experience as pilot of jet aircraft, pass a NASA Class 1 physical and be between 5ft 4in and 6ft 4in tall.

Mission specialists need the same academic qualifications together with three years related professional experience. The other restrictions are easier with only a Class 2 physical required and candidates as short as 5ft 0in considered.

The newcomers are pilots Michael Baker, Robert Cabana, Brian Duffy, Terrence Henricks, Stephen Oswald and Stephen Thorne. The mission specialists are Jerome Apt, Charles Gemar, Linda Godwin, Richard Hieb, Tamara Jernigan, Carl Meade and Pierre Thout.

NASA backing

The famous Jet Propulsion Laboratory at Pasadena, California, is to seek backing from NASA for its Mariner Mark II space probe. The probe would be of modular design, and the first mission would be to rendezvous a probe with comet Wild 2. If backing is received, the mission will go ahead in 1991. The second proposed mission would be to investigate the planet Saturn, and one of its moons, Titan.

Jumble sale

The world's first second-hand satellite could be in orbit by November. Palapa B2, one of the two comsats salvaged on Shuttle mission 51A, is up for sale and Lloyds, the satellite's original insurers, are seeking a buyer. If successful, terms in the recovery contract will enable Palapa to be relaunched at a reduced rate.

Dust to dust

The US Government has given its approval to Celestis' plans to use a Conestoga rocket for the launch of packages of cremation ashes into a high Earth orbit. The cost of this service is $5000 per package, and the rocket's payload will consist of some 15,000 such packages. A macabre payload, if ever there was one.

SOVIET NEWS

USSR offers Proton launch

The Soviet Union has joined the lucrative race to secure the launch of the Inmarsat maritime communications satellites. The Soviets have offered their Proton launch vehicle for the British Aerospace built satellites. Launch costs would be $12 million each.

Proton had previously been ruled out as a launcher because of Soviet reluctance to allow technicians access to their launch facilities at Tyuratam. It now seems that engineers from other countries *will* be allowed to assist with payload integration.

The Soviet Union is a member of Inmarsat and points out that the organisation should choose the cheapest launcher available. Other competitors for the Inmarsat launches are the American Delta, Shuttle and Europe's Ariane.

Salyut 7 reactivated

The Soviet Union's first manned space mission of the year was launched on 6 June. The Soyuz T-13 spacecraft carried a two-man crew of Vladimir Dzhanibekov and Viktor Savinykh, both of whom have been into space before.

Western observers were surprised on 8 June when Dzhanibekov and Savinykh docked with the Salyut 7 space station. Reports from Moscow earlier in the year had led most analysts to believe that Salyut 7 had finished its operations and was to be abandoned.

The cosmonauts examined the solar panel and aerials of Salyut 7, before docking under manual control. They were joined on 23 June by the robot supply ship, Progress 24, by which time Dzhanibekov and Savinykh had finished the job of reactivating the station. The unmanned cargo ferry delivered fuel, equipment, research apparatus and mail to the resident crew.

Venus explored

The Soviet Union's two Vega probes to Venus and Halley's Comet have successfully completed the first part of their mission. The Vega-1 and Vega-2 spacecraft are now on course for Halley's Comet, having each dropped a pair of probes at Venus.

Each spacecraft comprises a Halley probe, a Venus atmospheric probe and a lander. The atmospheric probes were carried by balloons at a height of 30 miles above the Venusian surface. They recorded winds as strong as 150mph and drifted a third of the way around the planet.

The atmospheric probes lasted for 46hr before they ceased to function. The landers only broadcast for a short time, 21min in the case of Vega-1. The Vega-2 lander recorded a temperature of 450 degrees Centigrade and an atmospheric pressure 86 times greater than that on Earth.

Biosatellite returns

The seven-day flight of the Soviet biosatellite – Cosmos-1667 – with monkeys, rats, fish, insects, amphibia, and plants aboard has ended successfully. The 'space travellers' coped well with the conditions of zero-g and returned to Moscow, to the laboratories of the institute of medcio-bilogical problems.

Oleg Gazenko, the institute's director, commented: 'The latest flight is an important link in a consistent logically interconnected series of studies to determine the complicated reaction of living organisms to the unusual conditions of the space medium. The results of research carried out by the biosatellite make a valuable contribution to the effort to resolve many problems facing space biology and medicine.

'Unfortunately,' Oleg Gazenko went on to say, 'despite a wealth of data received during manned flights, far from everything is clear in the mechanism of changes taking place in a living organism in the first hours and days of the orbital flight, during the so-called acute period of adaptation to zero-g. As we know, at that time cosmonauts experience unpleasant sensations which affect their over-all physical state and ability for work.

'The studies involving animals shed additional light on the varied aspects of these phenomena. From that point of view the data received from the two latest biosatellites – Cosmos-1514 and Cosmos-1667 – are especially valuable. These satellites carried four monkeys which are closest to man as regards anatomical and physiological characteristics. With the help of intricate equipment and fine methods of research we managed to measure certain quantitative changes in the performance of the vestibular apparatus, re-distribution of blood in the organism and the dynamics of change of indicators characterising the functional state of muscles.

'The main result of the research carried out with the help of biosatellites,' Oleg Gazenko said in conclusion, 'is that they enhance the belief that man will be able to cope with the adverse effects that still hold him back from making his way into outer space for ensuring peaceful uses of that extra-terrestrial medium on a wider scale.'

Experts from the institute are to analyse and process the data received during the latest flight. Scientists from Bulgaria, Czechoslovakia, The German Democratic Republic, Hungary, Poland, Rumania, France and the United States will also take part in that work.

ESA NEWS

EXOSAT anniversary

X-ray astronomy is a fairly new branch of what surely must rank as one of mankind's oldest sciences. Still, it has been practised long enough for several anniversaries, and the latest one marks two years in orbit for ESA's Exosat. The X-ray observation satellite was launched on the 26 May 1983 and has proved very useful to scientists in their understanding of the cosmos. Dead stars, supernovae, quasars and distant galaxy clusters have all come under the close scrutiny of Exosat's equipment. Observations will continue as long as the satellite remains functional.

French contenders

The role of prime contractor for the French Hermes spaceplane project is being battled out between Aerospatiale and Dassault-Breguet. The former design resembles NASA's own Shuttle, but on a much smaller scale, while the Dassault proposal is similar in design to the Soviet minishuttle that has been tested recently.

Giotto on its way

The European Space Agency's Giotto probe to Halley's Comet was successfully launched on 2 July. The spacecraft left the launch pad at Kouro, French Guiana, 13sec after 1123hr GMT, and was carried into Earth orbit by an Ariane 1 launcher. Giotto's launch marked the 14th flight of Ariane, designated V14. (The letter V refers to the French word 'vol' and is used to identify Ariane missions from number 8 onwards.) The launch was slightly delayed by the Range Safety Officer when a fault appeared in a safety system, but Giotto eventually got away just 10min late.

Ariane V14 marked the first attempt at experimental recovery of the first stage. Three parachutes were placed inside the rocket, but only one of them deployed, and the stage fell into the sea much faster than it should have done. Although the recovery crew tried valiantly to get to the errant rocket, by the time their ship arrived Ariana V14 had gone.

When Giotto separated from the third stage of Ariane, 22min after launch, the European Space Operations Centre (ESOC) at Darmstadt, West Germany, took over control. The next 32hr were spent conducting a series of checks on the spacecraft. ESOC commanded Giotto to perform a series of spin-up and attitude manoeuvres and analysed details of the spacecraft's attitude and orbit.

Giotto was found to be in good shape and at 1924hr GMT on 3 July, with the spacecraft making its third orbit of the Earth, ESOC sent the command for its on board engine to fire. The burn was successful and put the spacecraft into solar orbit. Giotto is now on course for a rendezvous with Halley's Comet on 13 March 1986.

Eureca plans approved

The industrial contract for the development of the European Retrievable Carrier, Eureca, was signed on 14 June. Eureca is a free-flying, recoverable carrier of orbital experiments which will be launched by the Space Shuttle and remain in orbit for missions of 6-8 months duration. The first launch is scheduled for March 1988 and the platform will be retrieved by the Shuttle six months later. The payload will comprise experiments in microgravity science.

Eureca could play an important role in the NASA Space Station project. It could either act as a free-flying, man-tended platform in the same orbit as the Space Station, or be placed into polar orbit, or be docked with the Space Station for servicing.

East joins West

The European Space Agency is discussing a possible joint project with the Soviet Union. This would involve one or two ESA experiments flying with the Soviet Mars probes which are scheduled for launch in 1988.

Intelsat launch success

The communications satellite Intelsat VA-F11 was successfully launched by an Atlas-Centaur on 29 June – the 64th launch of the Atlas-Centaur vehicle. The 65th is scheduled to take Intelsat VA-F12 into orbit late in September. Intelsat have three more VA satellites to be launched, but the contract for these has been won by Ariane.

ORIENTAL NEWS

New projects planned

The People's Republic of China is planning a major expansion of its activities in space over the next few years. Foremost among these plans is a large booster to put Chinese-built satellites into orbit in the 1990s.

China already has two operational launchers, the CZ-2 and CZ-3. The Chinese are considering joining the race to secure international satellite launches by offering the CZ-3 launcher as a direct competitor for the smaller payloads launched by Ariane and Shuttle. The CZ-3 and earlier CZ-2 have successfully placed 12 payloads into orbit since 1975, but there have also been several failures.

China's next space launch is expected to take place later this year when the seventh in a series of low altitude imaging satellites is put into orbit. This will be followed by the launch of a geostationary communications satellite in late 1985 or early 1986.

There is already one Chinese communications satellite in orbit. The STW-1 satellite was launched on 8 April 1984 and was still operating over a year later, despite having a designed life of only one month.

Broadcast satellite delay

The launch of Japan's first BS-3 direct broadcast satellite is likely to be delayed from its original 1989 target by at least a year. The Japanese are asking manufacturers to share the risk should future satellites fail in operation. The manufacturers are not very keen to do so.

The move follows the failure in orbit of transponders on the BS-2a satellite and of pre-launch problems with BS-2b. Japan has not had a very happy record with its satellites so far; its GMS and GMS-2 weather satellites also gave problems.

Oriental Shuttle?

The Japanese are reported to be studying their own shuttle-type vehicle. The spacecraft would be called Himes, for Highly Manoeuvrable Experimental Space Vehicle. Himes would carry payloads of 500kg to 2000kg into orbit without using a booster. The vehicle would then glide back to Earth for a runway landing.

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Australia prepares

Congratulations on your excellent magazine. There are not any sci(fi) mags such as yours published here in Australia that I know of so it helps to fill a large gap.

The return of Halley's Comet next year will bring an exciting new topic to your magazine and I am glad to say that here down under, we shall be in the best position to see it. I am a student at Sydney University and Secretary of the university's Astronomical Society.

Preparations being made here include the new Australian telescope with its 2.3m mirror. It's the most advanced optical telescope ever built and is situated at Siding Springs near Canberra. Also, situated there is the 3.9m Anglo-Australian telescope, a 1.2m Schmidt camera owned by the UK Science and Research Council, and 1m, 0.6m and 0.4m reflectors. Australia will also be receiving radio signals from some of the six probes sent to intercept Halley's Comet.

I have not seen in your magazine any information about the 'Star Wars' program or President Mitterand's alternative program, Eureka. Please let's have some articles on these.

Wahroonga **Jol Valentine**
Sydney
Australia

Autograph hunter

I am writing to see if anyone can help me. I am a space enthusiast and have a collection of signed photographs of astronauts and cosmonauts, and I'm searching for photographs of the following:

1. USSR Pilot/Cosmonaut decorations/wings/medals.

2. Cosmonaut decorations of Czechslovakia, Romania, Vietnam, Poland, Bulgaria, Hungary, Cuba, DDR, France, Mongolia and India.

Anyone who can help with these, and also anyone who has the same interesting hobby as myself, please contact me at:

24 Mabel Street **Ian White**
Colne
Lancs BB8 0JR

Thunderbirds Appeal

This is the first time I've ever written to a magazine and I'm a bit jittery about it. Seriously, I just wanted to say how much I've enjoyed your magazine right from the pilot issue.

What has finally spurred me into putting pen to paper is the superb David Nightingale articles on Gerry Anderson and his puppet creations. I have a weakness for *Thunderbirds* in particular – many thanks for the photos of these and other models.

I'm surprised that Mr Anderson cannot say why *Thunderbirds* appealed so much to youngsters in those days. There were the dramatic opening credits; the stunning models and equipment; the exotic island base with its secret concealed hangars; totally believable characterisation; good, tense scripts but blended with humour – especially Parker; and that 'will they, won't they?' element that was so sadly lacking in the likes of *Joe 90.*

I hope this has been of interest to you, and I shall now shut up for the remainder of **Space Voyager's** career, which I hope will be a long and successful one.

Hall Green **Glen Jones**
Birmingham

FAB 1, where are you?

Just received your last issue – it's great as usual, especially the article on Gerry Anderson. It brought back many memories, particularly seeing the life-size replica of Lady Penelope's Rolls Royce, FAB 1, at a local car showroom. Does anyone know whatever happened to the car?

Fareham **Steve Watts**
Hants

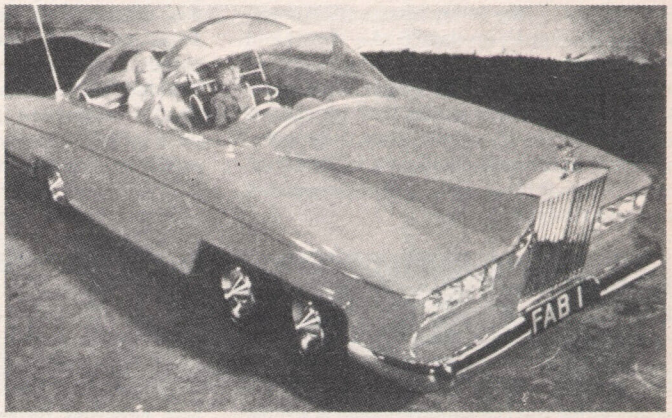
(It's probably owned by some rock star. We'll endeavour to find out.)

Skydiver

In the final part of the Gerry Anderson feature, David Nightingale states that in *UFO* you never saw more than one skydiver but, in fact, in the episode called *The Psychobombs*, Skydiver 3 was destroyed by one of the aforementioned psychobombs played by Mike Pratt – star of *Randall and Hopkirk (deceased).*

There's pedantry for you!

Richmond **Guy Pitchford**
Surrey



Whatever happened to Fab 1?

No more repeats

Concerning the subject of mass media science fiction, ie television, the various channels have been criticised on the whole for not repeating, or for killing off, old series. I can hardly remember how many letters I've read in your magazine saying, 'why, oh why, did the BBC have to kill Blake?' or 'what right have the BBC not to let us see yet another repeat of *Star Trek?*'

Instead of all this, I feel that television should be encouraged to produce some new SF series, either specially commissioned as were the excellent 'Plays for Tomorrow' shown last year, or using existing SF stories.

After all, isn't it one of the main philosophies of SF that we look towards the future rather than the past? One step in the right direction was *Tripods*, but this underlines another problem with TV SF – the attitude that it is basically kiddies' stuff.

There is a thin, hardly discernable line between serious SF and fantasy. *Blake's 7* became real when it started killing off its central characters, for which it must beat *Star Trek* hands down. *Alien* had an atmosphere of reality, as did *Bladerunner* and even *Hitchikers Guide; Battlestar Galactica* and *Buck Rogers* did not.

So let's have some protest letters to the BBC asking for some new SF for a change, and which does not necessarily have to be shown before 9.00 in the evening.

Hornchurch **John Cooper**
Essex

Rethink

I would endorse **Space Voyager's** concern regarding the BBC's proposals to 'rest' *Dr Who* for a year, but I also feel that they are justified in their actions. A rethink is definately needed.

I approve of Colin Baker's portrayal and, in general, I approve of the longer episodes which gave adequate time for the various themes to be developed, but I have one major reservation. This concerns the violence which featured in the serious and seemed to be escalating to a level which I found very disturbing.

Although *Dr Who* is meant to be a children's programme, it's a well known fact that many adults also watch and I wonder how many are equally concerned about the violence. It's one thing to have the Daleks destroyed because they are not true living beings, but it's quite another to see Shockeye casually carring a severed leg around with him!

Heaven forbid that I should ever agree with Mary Whitehouse but, on this occasion, I have to. *Dr Who* needs a good,

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thorough rethink and I hope that this happens during the next 12 months.

Warley **M Fitzgerald**
West Midlands

Shorter the better

Re the *Dr Who* 'rest'. While I agree that Michael Grade is totally out of touch with the good Doctor's legions of fans, and that the decision should be fought, I don't think that the new 45min formula suited some of the recent stories.

The old 25min shows gave one time to 'get to know' the guest characters and to 'work out' some of the more convuluted plot developments. For the more casual, less obsessive viewer, this was a better format. Viewers also had time to 'get into' the story gradually; a fault with some recent episodes was that they were both rushed and took a lot of following.

The next series would benefit from 25min episodes shown at a later hour (less kiddie viewers, less complaints?). In the meantime, how about some vintage (ie over eight years old) repeats?

Crosby **Gillian Moore**
Maryport
Cumbria

Two-faced

After reading the *V* problems posed by Maragaret Cassidy, I thought on the problem for a while and came to a few conclusions. The first problem of what the lizards did with their tongues when talking to humans was the hardest to solve but, hopefully, can be explained.

On page 92 of *V* by AC Crispin, it mentions a visitor appearing to have two sets of teeth (one inside the other). This implies two mouths – the first being the visitor's own and the other being that of the human face mask. On page 93 it explains that the visitors can only speak their own language when their masks are removed. The only conclusion must be that their tongues are curled up inside somehow.

The second problem of the visitors tolerating the cold was much simpler to solve. They resist the cold because their fake skins act as insulation and their uniforms are also insulated. For proof, look at page 166 of *V*.

A problem I would like solved is why the visitors just didn't kidnap a few humans and clone them to produce a food supply? If they had, no doubt the TV series would have been a lot shorter!

Spennymoor **Paul Trueman**
Co Durham

V – two-faced aliens with dental problems?

Visual effects

In Communications Bank issue 16, you printed a letter from Ian Price who was seeking advice on a visual effects career. I would like to make a few points.

At this stage the individual concerned is heading for a career in model construction which is, if you like, one of the elements involved in visual effects. Personally, I have been experimenting for the past three years with pyrotechnics, optics and a little bit with model filming. This is the approach which Ian should take: find out what you can do, film it, view it, write about it, and try to get people interested. Ignore Mat Irvine's advice – he is generally talking about the BBC Visual Effects Unit which, in my opinion, is pretty poor.

Find other people who have the same interests as you, get together and make a film of your efforts and send it to a club photographic society group or to the BBC's *Screen Test* which will be featured in *The Saturday Picture Show*. You must get together with other talented people because a group can survive far longer than individuals.

In the early '70s it may have been easy to break into visual effects but it's a lot more difficult now – but not impossible.

Portsmouth **Philip Johnson**
Hants

Reader participation?

Congratulations on an excellent magazine – very imaginative and forward thinking in style and content. Issue 15 excelled itself in every way: a good cross-section of science fact, fiction and fantasy.

A few points: would it be possible to publish articles written exclusively by readers, or at least allow a couple of pages for people to try their hand at communicating their philosophies/ideas to other readers? This would enhance the feeling that the magazine already has of reader participation but on a more general level.

Boscombe **Mark Emson**
Bournemouth

(Many of the features in Space Voyager *are written by readers, ie people who read the magazine regularly and have been inspired to submit their own material following our contributors' guidelines. Most contributors are* not *professional journalists, but it would be rather patronising to by-line their stories as 'Joe Bloggs – A Reader', don't you think?*

Anyone is welcome to submit material for consideration. As for a couple of pages for communicating ideas – I was under the impression that Communications Bank did just that.)

Short stories

Long, long ago, in an issue far away (number 9) there appeared a letter from Tim Robinson asking about the possibility of publishing short stories in **Space Voyager**. The then Editor, Ian Graham, replied that **Space Voyager** would soon be doing just that.

Well, here we are, a year on, and with Ian Graham gone, the stories have gone with him.

Moreton-on-Lugg
Hereford **Stewart Morri**

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(Stewart, and many other readers, I'm sure, will be pleased to know that we intend to run regular sci-fi short stories in ***Space Voyager*** *as from the next issue, provided we can find interesting and original material. So get scribbling.)*

Kiwi TV

I have been a reader of **SV** since the pilot issue, and I wish to say how much I enjoy it, particularly the articles on the Gerry Anderson shows. I grew up watching these, along with *Star Trek, Dr Who* and *Lost in Space*, although I do not remember *Supercar* or *Fireball XL5*.

Some time ago TVNZ ran some movies in which two or three episodes of *Stingray, Captain Scarlet* and *Space 1999* had been edited together.

I was surprised to hear that the BBC banned some episodes of *Star Trek*; TVNZ is currently screening the series at 11am on Saturdays along with *Fraggle Rock, Get Smart, The Munsters* and a magazine programme which is clearly aimed at children, so they obviously do not consider it unsuitable. Another series currently being repeated, for the first time since it was originally screened, is *Dr Who*. There was also a *Dr Who* movie which has been on TV a couple of times, *Dr Who and the Daleks* made in 1966, with Peter Cushing as the Doctor. I have not seen this movie mentioned anywhere, not even in the 20th Anniversary special published by the BBC. This means that there have in fact been seven Doctors, not six as is usually stated.

Auckland **Paul Adams**
New Zealand

SF on radio

I was pleased to see mentioned in your feature entitled 'Golden Years of SF' the classic Radio 4 serial *Journey into Space*. However, I have been dismayed by the non-mention in Communications Bank of another superb Radio 4 SF serial namely James Follett's *Earthsearch* and the sequel *Earthsearch II – Deathship*.

The show, in 10 weekly parts, received its first broadcast in January 1981 and was repeated later in the year. I was held enthralled for 10 solid weeks each time and the sequel had the same effect. The story is powerful and the characters even moreso. However, the two characters who steal the show are not, supposedly, human at all, they are the two super computers Angels One and Two, cleverly played by Sonia Fraser and Gordon Reid.

The whole feel of the show was excellent and the transition from book to radio was perfect. More please, James Follett and the Beeb.

Rotherham **David Chafen**
S. Yorks

Refreshing?

What a breath of fresh air the cover was for the June/July issue of **Space Voyager.** Although dark, deep space scenes are synonymous with science fiction/fact, the light, almost airy hues of number 15 were very refreshing.

A word of praise, too, for the articles on Gerry Anderson. Having been a child throughout the sixties and enjoying all the illustrious episodes of *Fireball XL5, Thunderbirds,* and *Captain Scarlet*, etc, the write ups and photographs brought the memories flooding back. Well done!

Gt Yarmouth **C E Howard**
Norfolk

Unimportant?

Thanks for a great magazine. I thoroughly enjoy every issue and have a hard time waiting for the next – how about going monthly? Anyway my main reason for writing is to comment on the remark made in Captain's Log, issue 15. I totally agree about the TV companies removing science fiction programmes from our screens, but you failed to mention ITV quietly removing a repeat run of *Space 1999* on a Saturday morning. Do the TV companies regard people interested in science fiction as unimportant and thus ignore their interests when planning their programme schedules?

Ashford **S Piper**
Middlesex

Every which way. . .

Re *2010:* heads down please, here comes the flack!

Although I enjoyed the film immensely and the book even more, found the final sequence very moving, thought that the SFX were superb, and generally don't criticise SF in general, I feel that I must point out something.

In my opinion, Discovery is spinning in the wrong axis. . . Surely, if the carousel is at right-angles to the ship's length, if it stopped spinning then the transferred momentum would cause the ship to roll over and over, not rotate along its length as shown.

Even if the carousel were in line with the ship's length then, when halted, the ship would surely spin about the main sphere, not the centre? Unless, of course, the carousel could be fitted into the centre 'bulge' above which is mounted the infamous dish. . . ooops – I may have just solved the 'fitting-in' difficulty of Mike Conroy (*2001* blunders, issue 11).

Ho hum. I think I may have wiped out the major blunder just by thinking about it for a while!

What else was there I didn't like. Well, after the richness of the Soviet characters in the book, I felt that they were a bit bland in the film, and the central American scenario I didn't like.

As with *2001* – in fact, even more so – I feel that the book could have been transcribed directly to film without the addition of sub-plots.

Thanks for an excellent publication which holds the attention and is very collectable.

Chilwell **Kevin Stevenson**
Notts

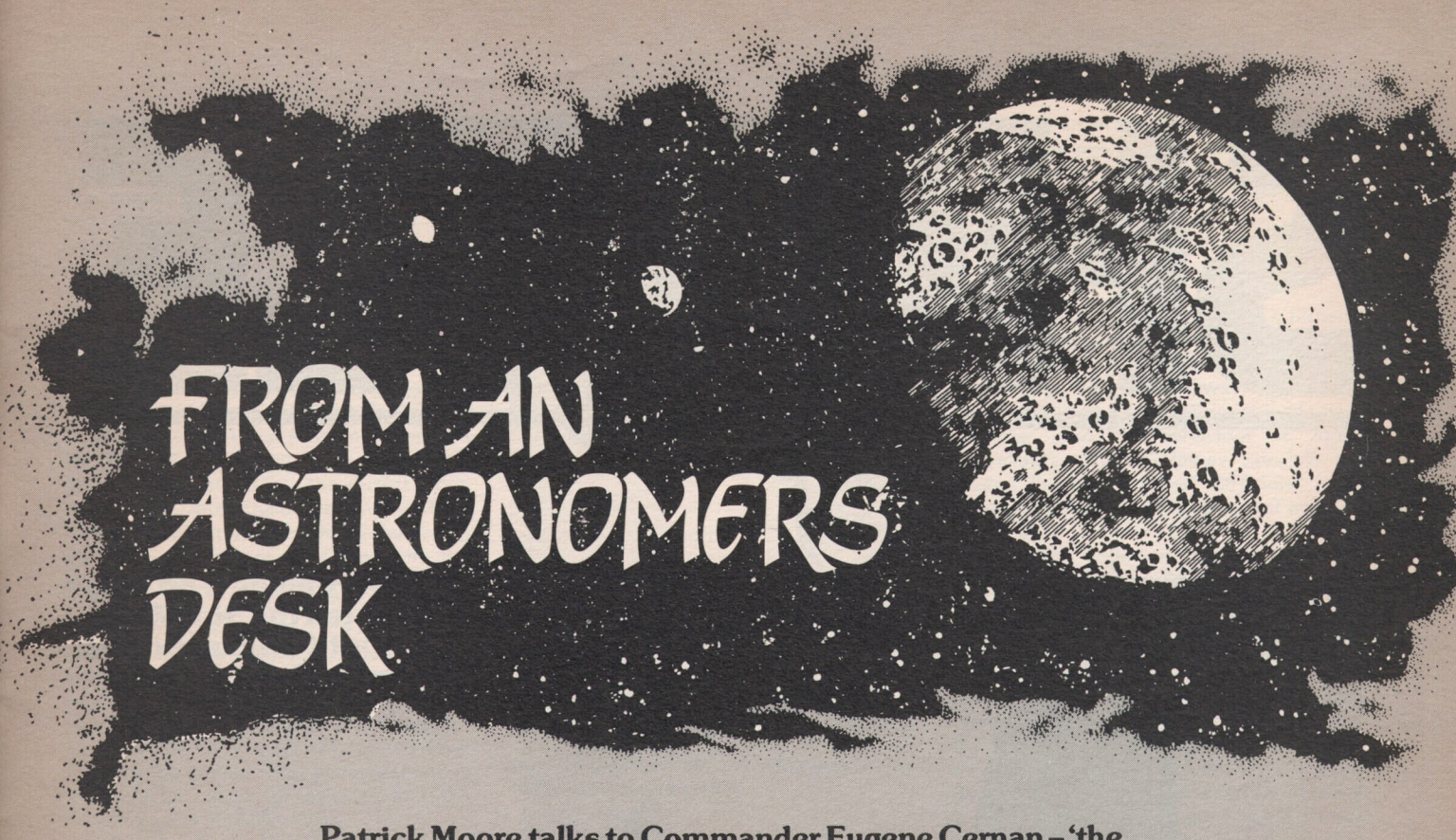
Index offer

In the last issue of **Space Voyager** a letter that was part of that issue's Communications Bank section asked if there was going to be an index produced for **SV** but you said that you did not fancy the task of compiling such an index yourself. Fear not, **SV** reader to the rescue – I have started such an index.

I have used the home micro to handle the task of storing all the information on disc, with software that I wrote myself using Atari's 32K version of Micro-Soft Basic. As yet I have not finished the indexing but if anyone is interested in an index then I would be pleased to hear from them (SAE please).

45 Bonsall St **S Cowans**
Blackburn
Lancs

Bladerunner – atmosphere of reality?



FROM AN ASTRONOMERS DESK

Patrick Moore talks to Commander Eugene Cernan – 'the last man on the Moon', and asks, when will we return?

Doesn't it seem a long time ago since the last men went to the Moon? The Apollo programme reached its climax in 1969, when Neil Armstrong and Edwin Aldrin stepped out on to the barren rocks of the Sea of Tranquillity; it ended in December 1972, with the flight of Apollo 17. The two 'Moon-walkers' on that trip were Commander Eugene Cernan and Dr Harrison ('Jack') Schmitt, a geologist who had been trained as an astronaut specially for the mission.

For some years before the landings I had been fairly actively involved, because I was one of the team mapping the Moon – and remember – we knew a great deal less about it then than we do now; there was even a suggestion that the lunar 'seas' might be filled with treacherous dust-drifts, though it was not a theory in which I had faith, and in the event it proved to be completely wrong. I spent a good deal of time on Moon-mapping from the Lowell Observatory in Arizona, using the great 24in refractor there. But there must be many of you now reading these words who were not even born at the time of Apollo 11. It is strange to recall that when I was, a teenager, the whole idea of lunar travel was usually dismissed as crazy!

Not long ago I had a long talk with Commander Cernan, who is, so far, the 'last man on the Moon'. When I asked him what was his most vivid memory, his answer was not quite what I had expected. 'Overall,' he said, 'everything was rather overshadowed by the view of the Earth itself. It's been said that the Moon is colourless, bland and unbeautiful, but that's not true; the Moon is beautiful and majestic, with its valleys and its towering mountains. Yet to me, the greatest realisation was that of standing in the middle of a dim charcoal picture, looking through the blackness of space – blackness even though it's filled with sunlight – and seeing the Earth, with its life and its colour. That meant more to me than stepping out on to the surface of the Moon.'

I asked next: 'Are stars visible in daylight from the lunar surface?' Earlier astronauts had been non-committal, but Gene Cernan was not: 'When you're standing in sunlight on the surface of the Moon, you can see stars if you concentrate very hard. Of course, when you're over the dark side of the Moon you're probably in the blackest blackness anyone can imagine. You're out of sight of the Earth, and you can't even see the Moon below you. All you can see are hundreds and hundreds of stars.'

There are all sorts of problems – navigation being one; remember, Gene Cernan and Jack Schmitt drove across the surface in their Lunar Rover or 'Moon-car'. Distances were hard to estimate. Moreover, the surface gravity on the Moon is only one-sixth of that on the Earth. 'When you're walking, and want to change direction, you have to make up your mind several steps before you start to turn; when you're driving along in the Lunar Rover and hit a rock, one side of the Rover will rise up. You always have to be careful. The only thing between you and the vacuum of space is your space-suit, and to puncture that would be fatal.' There was also the hazard of lunar dust. This 'was probably the most awkward of all. The dust is like graphite; but graphite lubricates, whereas lunar dust makes things stick together. It gets into your space-suits, and all moving parts of the vehicles. Back inside the Module, we took off our space-suits and we could actually handle the lunar samples we'd collected (something which is never done by Earth-based scientists), and the dust is so fine that it gets even into the pores of your skin. It took me many weeks after my return to get rid of the last traces of it.'

Much was learned from the Apollo missions, but when will men go back to the Moon? Here, too, Gene Cernan was cautious, but not pessimistic. 'I believe we'll go back. It may not be in my lifetime, or yours, because everything needs motivation. . . . I can't tell when that motivation will come; it may be a long time, or it may not. I believe we'll go to Mars, too, but again there's the need for motivation. If the Viking landers had shown little green men with long ears looking back at us, we'd be on our way to Mars now. But eventually – yes, we'll go back. There will be others who will follow in our steps.'

To his great regret, Gene Cernan will not go back to the Moon; we cannot expect any further flights for some years yet. But the idea of a fully fledged Lunar Base before the end of the century is by no means far-fetched; whether we achieve it or not depends more upon politics and finance than upon science.

Sooner or later, it must happen; but it could not have been made possible without the pioneer ventures of the men of Apollo. I am proud to have known Gene Cernan, Neil Armstrong and the rest. They will never be forgotten; their names and their achievements will be remembered as long as history lasts. ●

SHUTTLE *update*

Discovery made it on time and tested the Star Wars laser, but _Challenger_ had problems. Geoff Endacott reports

The 18th mission of the Space Shuttle programme began on 17 June with the launch of Discovery from the Kennedy Space Centre. The payload for the flight, designated 51-G, included three communications satellites and a free-flying astronomy platform.

Four inches of rain fell while the Shuttle was on the pad, including $\frac{1}{2}$in during a three-hour period the day before the launch. Then the launch was threatened by a power cut which shut off the pumps supplying gas to the orbiter, but emergency generators took over to save the situation. In the end, Discovery left the Cape just 45 milliseconds after the launch window opened.

The Mission Commander for this, the fifth flight of Discovery, was US Navy Captain Daniel Brandenstein, a veteran of the eighth Shuttle mission. John Creighton flew as Pilot, with Mission Specialists Shannon Lucid, Steven Nagel and John Fabian. The Payload Specialists were Frenchman Patrick Baudry and Sultan Salman Abdelazize Al-Saud from Saudi Arabia. Like Brandenstein, Fabian was making his second Shuttle flight, but the other crew members were new to space travel.

The first satellite to be deployed was the Mexican Morelos-A. This is the first of two satellites to be launched on behalf of the Mexican government. Following release from the Shuttle, Morelos-A was successfully boosted into geostationary orbit above the equator at 113.5 degrees west longitude. The second Mexican satellite, Morelos-B is due to be deployed by Space Shuttle Challenger in November.

Mission Day 2 saw the release of Arabsat-1B which was boosted into geostationary orbit at 26 degrees east. Arabsat was built by the French firm Aerospatiale

for the 22 member states of the Arab League. The first Arabsat was launched by the European Ariane vehicle in February. The chance to fly a Payload Specialist on the Shuttle may have influenced the Arab League's choice of launch vehicle for their second satellite.

The final satellite to be deployed was the American Telephone & Telegraph Co Telstar 3-D, which has now reached its operational position at 62 degrees west. All three satellites were carried into geostationary orbit by the McDonnell Douglas PAM-D Payload Assist Module. It was the PAM-D which failed to place the Westar and Palapa satellites into the correct orbits in February 1984. The success of the three satellite deployments on this mission will do much to restore confidence in the McDonnell Douglas booster.

Following the deployment of the three communications satellites, the crew turned their attention to Spartan-1. Spartan is an acronym for Shuttle Pointed Autonomous Research Tool for Astronomy and was deployed using the Shuttle's remote manipulator arm to fly on its own for two days. The satellite carried X-ray sensors to study the Perseus cluster of galaxies and the central core of the Milky Way.

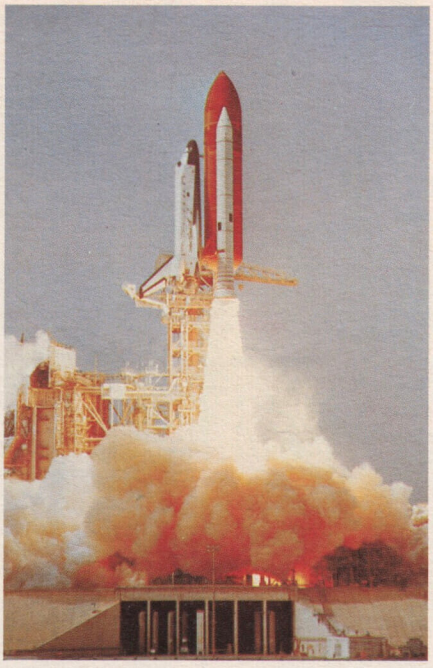
Once its observations had been completed, Discovery closed in to retrieve the satellite. The crew were a little surprised to find that Spartan had drifted into an unexpected attitude, but John Fabian successfully captured it with the robot arm. Mission controllers believe that Spartan ran short of the argon gas which is used for attitude control.

Three more Spartan payloads are due to be carried next year. These include Spartan-Halley in January which will observe a certain well-known comet; Spartan-2 and Spartan-3 are due to fly in October and December to study the Sun and regions of star fields.

Probably the most widely reported experiment conducted during Discovery's mission was the 'Star Wars' laser test. The high-precision tracking experiment involved a laser beam fired from the USAF Optical Station at Maui in Hawaii. A reflector mounted in the Shuttle's left-hand mid-deck window was designed to reflect the beam back to Maui.

The first attempt was an embarrassing failure: As Discovery approached Hawaii, the crew realised that the reflector was pointing into space. Brandenstein asked Mission Control to repeat the data which had been used to program the flight control computer and it was only then that they found two mistakes had been made.

First, commands had been set to the orbiter in feet instead of nautical miles; secondly, the longitude of Maui was sent as a 360 degree value, but the computer only accepts figures in the range of plus or minus 180 degrees. The computer rejected the data, but commanded the incorrect attitude. Rather than try to turn the orbiter, Mission Control abandoned the attempt until the following day. The first test simply

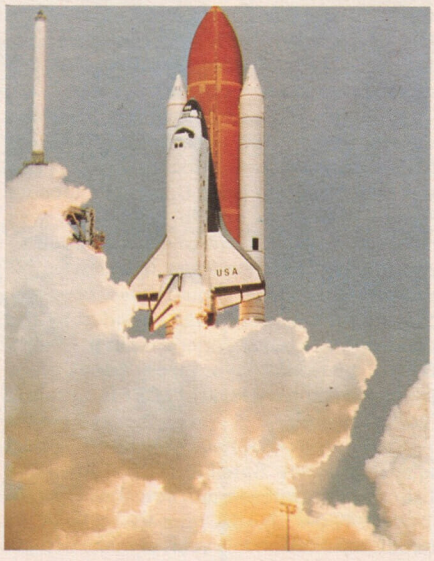


Despite the problems, mission plans during '86 and '87 are mounting.

involved the crew looking out of the orbiter to see the beam hitting the wrong side of their spacecraft . . .

When the Shuttle eventually flew over Maui pointing in the right direction, the test worked. The laser beam was only a $\frac{1}{4}$in in diameter when it was fired from Hawaii, but it reached Discovery measuring 30ft across. Part of the beam was successfully returned and the Shuttle was tracked by the Maui station for $2\frac{1}{2}$min.

Patrick Baudry was involved with a series of biomedical experiments during the mission. The two principal investigations were the French Postural Experiment and the French Electrocardiograph Experiment, designed to expand on data obtained by French cosmonaut Jean-Loup Chretien,



Four more Shuttle missions are planned for 1985.

who flew aboard the Soviet Soyuz T-6/ Salyut 7 mission in 1982. Baudry was able to obtain data on the immediate effects of adaptation to space by performing the experiments a few hours after launch. Chretien had to wait 48hr for Soyuz to dock with Salyut before he could begin to take readings.

The mid-deck area contained a furnace used for a materials processing experiment. Materials processing was also studied in three West German Getaway Special experiments housed in the payload bay, together with the behaviour of liquid propellants. Other Getaway Specials included investigations of ultraviolet radiation, heat transfer and a group of student projects.

Discovery landed at Edwards Air Force Base in California on 24 June after seven days in space. The only problem encountered on landing involved the main landing gear which sank about 6in into the surface of the not so dried-up lake bed. The landing strip at Edwards will continue to be used in preference to the Kennedy Space Centre while the problem of crosswinds is studied. Discovery's brakes locked during its last return to Kennedy when they had to be applied hard to keep the Shuttle on the runway.

Challenger should have carried Spacelab 2 into orbit on 12 July, but the launch attempt was aborted with 3sec to go. All three main engines had started when the Shuttle's onboard computers detected a fault in engine number two. The computers then shut down all three engines and initiated the launch abort sequence.

The problem concerned a valve in the engine chamber coolant circuit which failed to operate normally. Although each engine has two independent coolant circuits, mission rules state that a launch should not take place unless both systems are working.

The decision to abort a launch has to be made by computer because of the limited time available. The computers have only a few seconds in which to check that the three main engines are working normally before authorising solid rocket booster ignition. Once the solid rocket boosters have fired, the Shuttle has to be launched. Any subsequent problem would force the Shuttle to land at one of the emergency landing strips.

The NASA crew for mission 51-F comprises Commander Gordon Fullerton, Pilot Roy Bridges and Mission Specialists Story Musgrave, Anthony England and Karl Henize. Payload Specialists Loren Acton and John-David Bartoe complete the team. At a press conference held after the launch abort, Fullerton said that the crew were disappointed not to be in orbit, but glad they did not take off in a faulty spacecraft. NASA mission planners hoped that the problem could be solved in time for a second launch attempt before the end of July.

Challenger's eighth mission is notable not just for the launch abort, but also for an unusual addition to the crew. Loren Acton is a native of Montana and archaeologists

have recently found some dinosaur remains in the state. It has been suggested that these should become the new emblem of Montana and what better way is there to publicise an emblem than to take it into space? Loren Acton therefore planned to take a small piece of fossilised dinosaur into orbit.

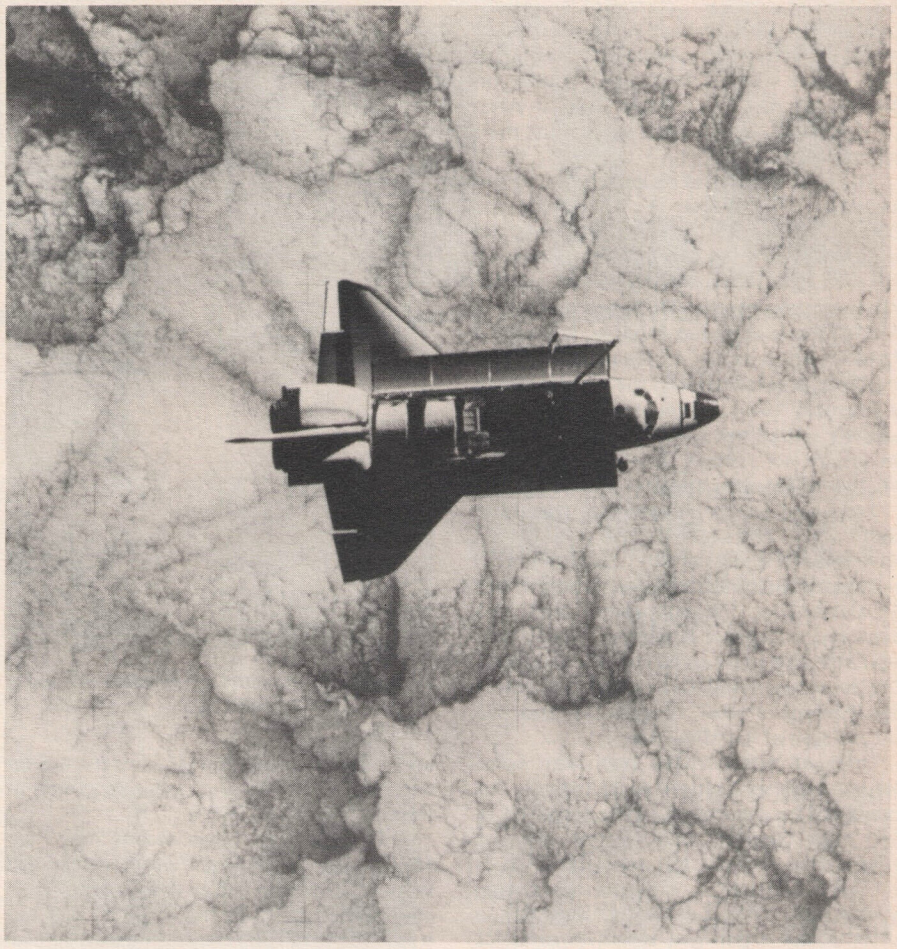
Spacelab 2 was due to be followed in August by the sixth flight of Discovery on mission 51-I. The launch was put back from its original 8 August schedule to allow an attempted repair of the satellite Leasat-3. This was left adrift after being deployed by Discovery in April, and its electrical system remains inactive, despite valiant attempts by the crew to switch it on with the infamous improvised 'fly-swatters'.

The Leasat-3 rescue plan is certainly ambitious: Two astronauts, James Van Hoften and William Fisher, will be required to perform a spacewalk, with Van Hoften standing on the robot manipulator arm controlled by John Lounge back inside Discovery. Van Hoften will have to attach a capture bar to Leasat and then manually stop the satellite spinning. Following a series of complex operations, if all goes well, Fisher and Van Hoften should have plugged a radio receiver into test sockets on the side of the satellite which will bypass the failed circuits and enable Leasat to be 'kick started' by a signal from the ground. By the time you read this you should know if NASA have succeeded. (The other crew members for mission 51-I are Commander Joe Engle, Pilot Richard Covey and Payload Specialists Gregory Jarvis and Charles Walker.)

Four more Shuttle missions are planned for 1985. The fourth orbiter, Atlantis, is due to make its debut on 26 September with mission 51-J. The Shuttle will carry a military payload under the command of Karol Bobko. Ronald Grabe is his Pilot and Mission Specialists Richard Mullane, Robert Stewart and David Hilmers complete the team.

The largest ever Shuttle crew is scheduled for launch aboard Columbia on 16 October. Mission 61-A carries the West German sponsored Spacelab D-1 and a crew of eight. The Commander and Pilot are Henry Hartsfield and Stephen Nagel, and NASA will also provide Mission Specialists James Buchli, Bonnie Dunbar and Guion Bluford. Three Payload Specialists are also assigned to the crew – Reinhard Furrer and Ernst Messerschmid of West Germany and Dutchman Wubbo Ockels.

Challenger ventures into space for the ninth time on 8 November with mission 61-B. The mission will include the launch of three communications satellites and the first large scale pharmaceutical production experiment. Brewster Shaw is listed to lead the crew of Pilot Bryan O'Connor and Mission Specialists Mary Cleave, Sherwood Spring and Jerry Ross. Rudolfo Neri Vela will fly as a Payload Specialist to become the first Mexican in space and a McDonnell Douglas Payload Specialist will also be carried.



Challenger photographed from above by the SPAS satellite.
Photo: NASA/Hasselblad.

The last scheduled flight of the year is mission 61-C, due to be launched on 20 December. This is a seven-day mission, so the crew will spend Christmas in orbit. Commander Robert Gibson, Pilot Charles Bolden and Mission Specialists Frank Chang-Diaz, Steven Hawley and George Nelson will launch two communications satellites. A Payload Specialist from RCA is due to be added to the crew.

Although these are the only missions scheduled for 1985 at the time of writing, NASA do have two outstanding tasks to perform. First, the Long Duration Exposure Facility (LDEF) is still in orbit. This was released in April 1984 and is designed to provide long term exposure to space for 57 experiments. LDEF should have been retrieved by now, but it was stranded by the cancellation of Challenger's flight in March. Other missions have since been given priority and the retrieval of LDEF is currently 'under review'.

Secondly, NASA have only one Tracking and Data Relay Satellite (TDRS) in place. Launch of the subsequent satellites is again 'under review'. NASA may try to fit in an additional mission this year, or make adjustments to the payloads of those which are already scheduled.

Assuming that the remaining missions in 1985 fly as planned, there will have been 24 Space Shuttle flights in the five-year period 1981-5, and 10 of these will have flown in 1985 alone. NASA have now published a flight manifest which shows a marked increase in Shuttle operations during 1986 and 1987. Definite plans have been made for 15 missions during 1986 and a 16th is likely to be added. The 1987 manifest already includes 17 missions, while long term plans envisage a launch rate of 24 missions per year by 1989.

All being well, 1986 will finally see a British astronaut making his way into orbit – more than 25 years after Yuri Gagarin! Squadron Leader Nigel Wood will join the crew of Columbia on mission 61-H which is scheduled for launch on 23 June. The Shuttle will be flown by Commander Michael Coats and Pilot John Blaha. Mission Specialists will be Anna Fisher, Norman Thagard and Robert Springer. Nigel Wood will also be joined by a Payload Specialist from Indonesia.

Britain's second astronaut, Commander Peter Longhurst, is listed to fly on board Atlantis with mission 71-D. Commander Longhurst's launch is set for 15 December but the other members of the 71-D crew have not yet been announced. ●

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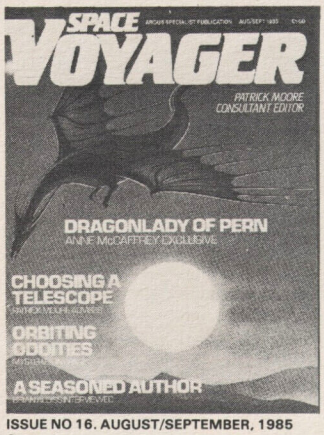

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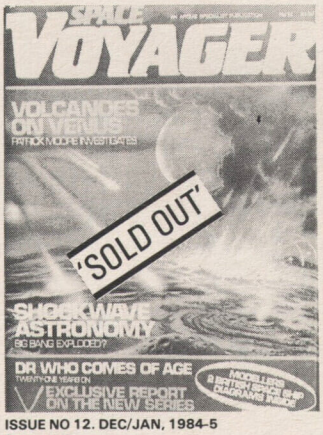

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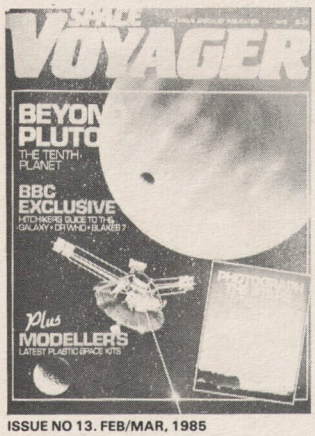

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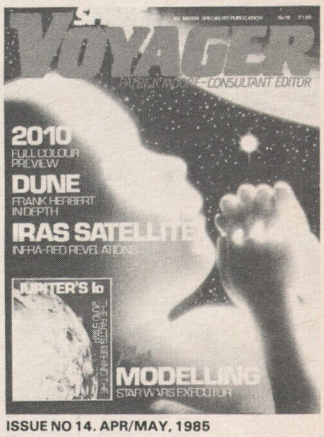

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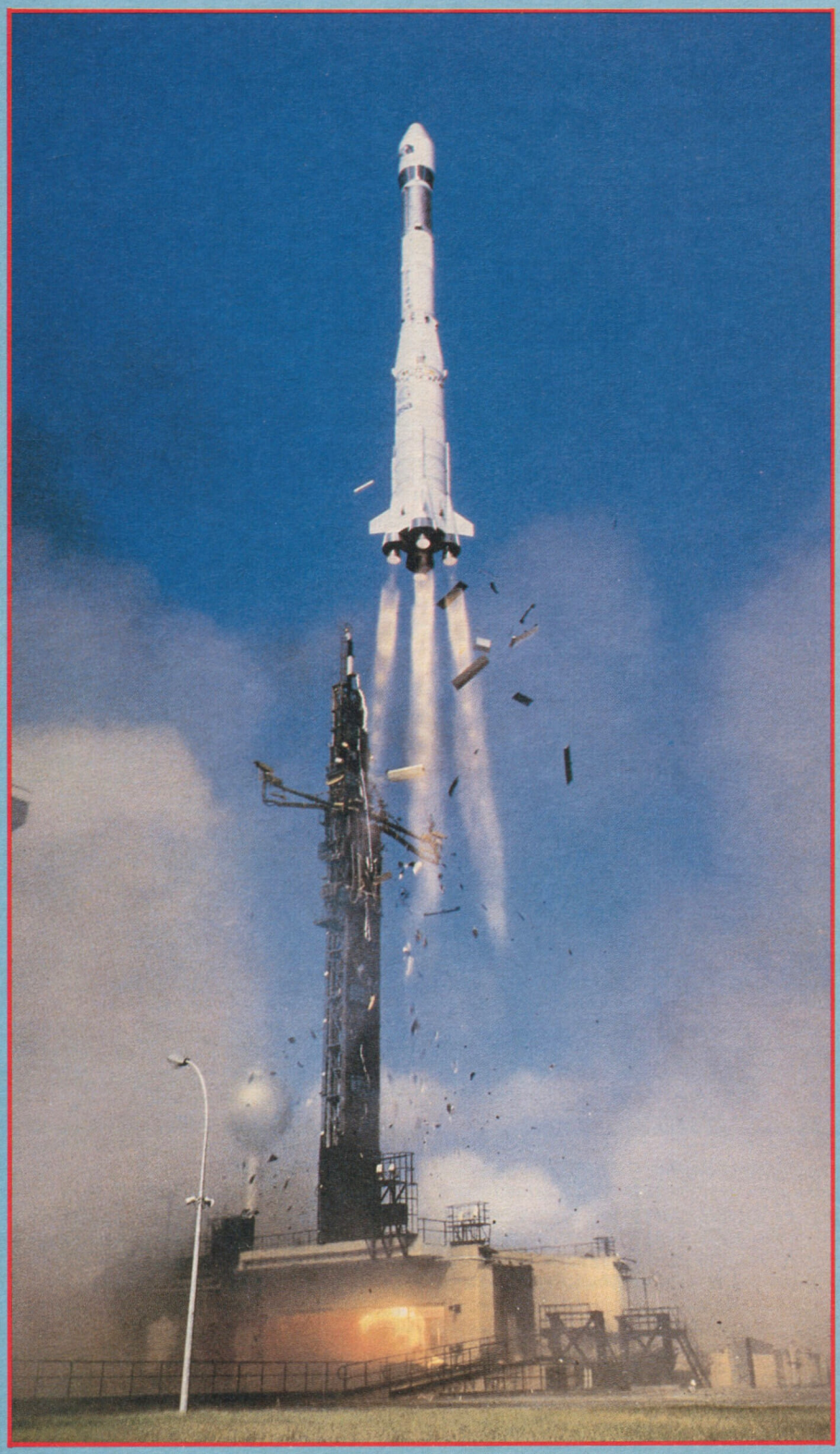


Ariane L-6 clears the Kourou tower in June 1983. This mission was the first to use SYLDA, from which Ariane 4's SPELDA payload system is derived. Photo: ESA/Arianespace.

Anthony Nettle traces the history and development of the Ariane launcher system as Ariane 4 prepares for lift-off next year

European launch systems have a history of delays and misfortune, yet in recent years the Ariane launcher has really begun to prove itself in a way that cannot be ignored by anyone with even a passing interest in space technology. The early development, initial problems, and final successes of Arianes 1, 2 and 3 were covered by Ian Graham in **Space Voyager** issue 9; since then, a great deal of research and development has gone into the considerably upgraded Ariane 4, a launcher possessing the ability to place larger, heavier payloads into orbit, and thus compete directly with NASA's orbiters.

Ariane 4's gestation period stretches right back to January 1982, at which time go-ahead for the design was given by the European Space Agency. A development budget of £123m was allocated for the new launcher, and organisation of research and development work was pretty much the same as for the preceding Ariane launch vehicles.

Based at Evry, near Paris, Arianespace is a private French corporation which draws together the technical talents of major European companies such as Aeritalia, Aerospatiale, Dornier, Ferranti, SAAB, and Volvo. Thirteen major European banks act as shareholders. Not surprisingly, with such backing, Arianespace is now moving forward in leaps and bounds and the Ariane 4 programme is currently on schedule, with a peak in production activity likely to have occurred by the time you read this.

A quick glance at design drawings for the new launcher highlights the similarities with its smaller sisters, and this commonality is far from being just skin-deep. One of the main reasons for the lack of problems during this programme has been the minimal time needed to test various stages of the design as they have already been proved in the operational launches of the preceding Arianes.

Changing a thoroughbred

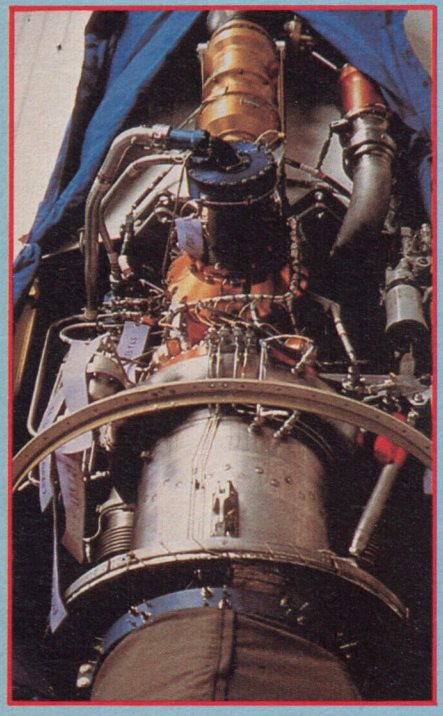
The primary differences between Ariane 4 and its predecessors are those of flexibility. A great deal of development work has been put into new strap-on booster units,

LAUNCHER

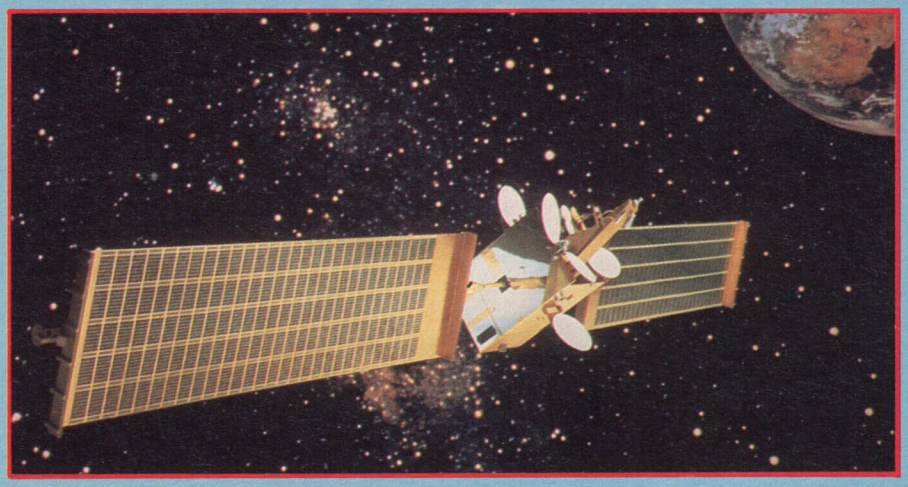
although they do use similar principles as those of Ariane 3, being of the liquid propellant variety. Alternately, solid propellant units can also be utilised, and again these have been further improved from the original Ariane 3 units.

It is the utilisation of these upgraded strap-on units that gives Ariane 4 such flexibility when it comes to payload-carrying abilities. In all, there are six possible launch configurations using the basic launcher and varying numbers of the two booster unit types. The first, identified by the suffix 40, uses just the basic launch vehicle, and is able to place 1900kg in orbit; 42P signifies the addition of two solid boosters, which allow the payload to rise to 2600 kg; 44P uses four of the solid boosters, and can lift 3000kg. Two liquid boosters alone go to make up 42L, with a weight-lifting ability of 3200kg; 44LP is noteworthy for using a combination of two liquid and two solid booster units, while 44L is made up of four liquid units. These latter two variants can carry 3700kg and 4200kg respectively.

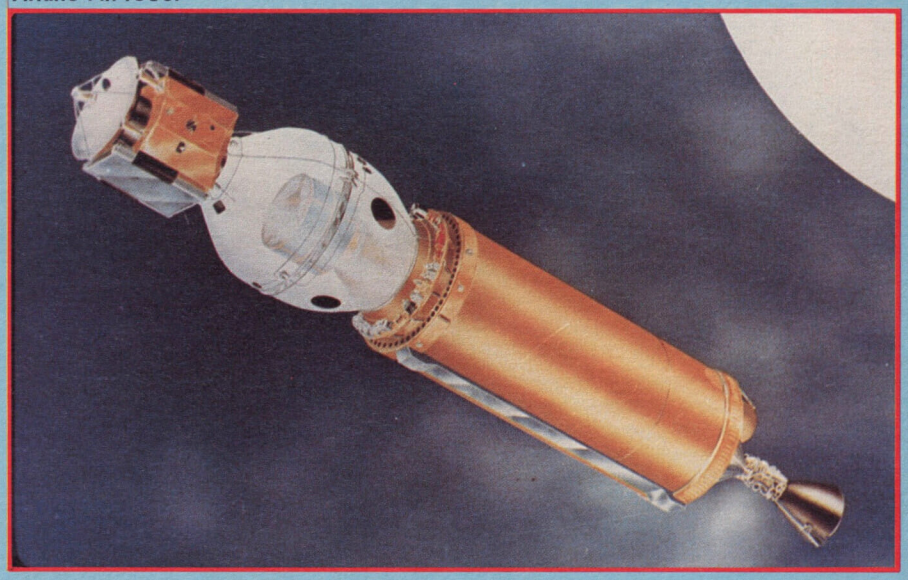
Other changes to the early designs include a completely new payload housing module. Again, there is a range of modules to suit differing payload requirements. A typical configuration would utilise the SPELDA dual-launch nose structure. This module is constructed from an aluminium alloy honeycomb material, with carbon fibre bulkheads. The SPELDA system enables launch of two satellites, such as the Eurostar and Olympus types. Alternatively, if requirements demand it, a third satellite may also be carried in the same SPELDA fairing.



A Viking rocket motor, here fitted to an Ariane 3 launcher.



An artist's impression of the L-Sat telecommunications satellite which is to be launched by Ariane 4 in 1986.



An artist's impression of the SYLDA system currently used for dual launches from Ariane.

Overall height of Ariane 4, when fitted with SPELDA, is 58.4m compared with the 49m of Arianes 2 and 3. Lift-off mass totals some 471 tons, whereas Arianes 1, 2 and 3 totalled 201.5, 219 and 237 tons respectively. This vast increase is, of course, partly due to the ability to handle larger, heavier payloads, and the remainder is attributable to the trap-on booster units and the general reinforcement of all main structures and main fuel tanks.

Construction and technical configuration

Ariane 4, as has already been mentioned, is based upon a modular design concept, utilising combinations of strap-on boosters and payload fairings. The first stage, L-220, is powered by four Viking V rocket motors, each developing some 668kn of thrust, and having a burn-time of 204sec. The liquid strap-on units add to this 661kn of thrust and a burn time of 135sec apiece, while the solid units can provide 625kn thrust and a modest 34sec of burn time. L-34, the second stage, has a single Viking IV motor, developing 768kn of thrust in vacuum, and having a burn time of 123sec. The third stage, H-10, is equipped with an HM-7 cryogenic propellant motor unit, which will

give 62kn of thrust in vacuum, and has a lengthy burn time of 725sec.

The three motor stages are separated by two small interstage units, while the payload fairing is bolted straight onto the upper motor unit by means of a Vehicle Equipment Bay interface. The usage of an inertial guidance system enables Ariane 4 to attain a high orbit injection accuracy, and typical deviation values are quoted as being 100km on apogee, 1km on perigee, and 0.07 degrees on inclination.

Production of the launcher is taking place on the same lines as its predecessors, with the usual rigorous test and control procedures that are associated with the construction of any launch vehicle. Integration with its satellite payload is quick and simple thanks to the straightforward design of the payload fairings and relevant equipment systems. Eight to 10 days are all that is needed for the encapsulation and mating of payload with launcher, and the actual launch preparations themselves.

The launch centre

The Guiana Space Centre has been described in these pages before, but a brief recap might not come amiss, especially as the second launch pad has reached completion. The centre's location at Kourou (latitute 5°14 N) suits it for launches into a wide range of orbits, both in northerly and easterly directions, at any azimuth between −10.5 degrees and +93.5 degrees from due North.

Ancillary facilities include a weather station, telemetry and radar tracking systems, and the new payload preparation complex. Mission-related facilities also include a satellite preparation and check-out building, a launcher assembly and fueling building, pyrotechnics storage dumps and fuel tanks. The centre is located within easy reach of the capital city, Cayenne, which can provide hotels, schools, churches, shopping facilities and emergency services for launch centre staff.

The new ELA-2 pad has been constructed very much with the requirements of Ariane 4 in mind. The launch vehicle is integrated vertically in the assembly building prior to being moved, on its launch platform, to the pad and neighbouring servicing tower. It is here that the already-encapsulated payload will be mated to the launcher itself. Six hours before launch, the servicing tower is rolled back.

The new launch complex is layed out specifically to enable two separate launch vehicles to be prepared at the same time, one in the Vertical Assembly Building, and one in the Servicing Tower. This parallel preparation means that the interval between Ariane 4 launches will be as low as one month. In fact, up to four launchers can be accommodated within the preparation facilities at any one time.

Commercial viability

With 10 or 12 launches per year from ELA-2, Ariane 4 will compete directly with NASA's Orbiters, given their present launch rate. Not surprisingly, the Ariane 4 launch order book is already full right up until mid-1987, while 1988 launch orders are already being placed.

The first Ariane 4 launch is scheduled to take place next year, and this will be in its 44LP variant, with two liquid and two solid boosters fitted. The choice behind this variant is two-fold: First, it will prove all of Ariane 4's systems in one mission and, secondly 44LP is the variant required for orbital placement of Intelsat 1V, Intelsat being one of Arianespace's main customers.

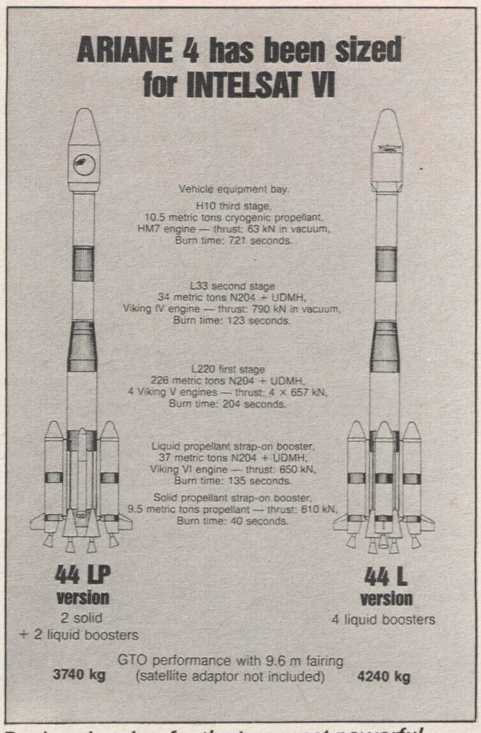
Cost of launch is more than competitive with NASA's Orbiters. Obviously the final cost to a customer will depend very much on the payload that has to be placed in orbit, and also the ever-increasing satellite insurance rates, but with Shuttle prices rising, and the fact that the siting of Ariane's pad means it can lift 17% more payload for the same effort required from Cape Kennedy, Ariane 4 is bound to become a more attractive proposition.

Future developments

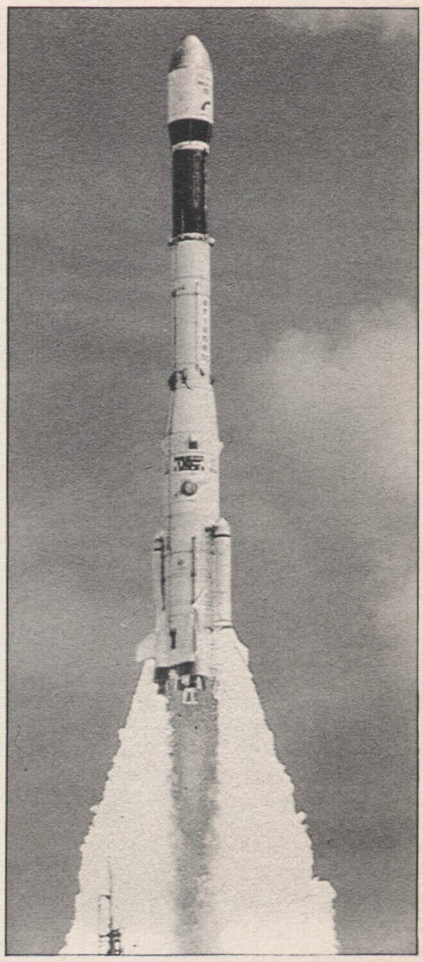
With launch orders being placed for the next three years already, it comes as no surprise that Arianespace are already capitalising on this by beginning development of Ariane 4's successor, Ariane 5. Decisions taken at The ESA Council Meeting in January 1985 have called for the full-scale development of this even more powerful launch vehicle, which will utilise further research and development into cryogenic propellant rocket systems. The design will be different from its four sisters in that it will have a central core comprising the new HM-60 cryogenic motor, and fuel tanks for the liquid hydrogen and oxygen propellants. Strap-on boosters will again be utilised when need be, and payload lifting abilities will be on par with those of the Shuttle and its matched Centaur G upper stage.

On to this central core can be fitted one of two secondary stages, either the L-4 low-energy stage or the H-10 high-energy stage. Alternatively, the Ariane 5 core will be able to be matched with the new Hermes space plane now under development. Indeed, the notion of launching a manned vehicle has been a major factor in the development work taking place on Ariane 5.

Entry into service has been projected for 1994, and it remains to be seen whether things will go as smoothly for Ariane 5/Hermes as they have so far done for Ariane 4. We must all wait with baited breath until July 1986, when Ariane 4 will make its first flight. One thing we can be sure of, regardless of success or failure, is that the Ariane story is far from over. Naturally, **Space Voyager** will continue to chronicle the saga as it unfolds. ●


ARIANE 4 has been sized for INTELSAT VI
Vehicle equipment bay.
H10 third stage.
10.5 metric tons cryogenic propellant.
HM7 engine — thrust: 63 kN in vacuum.
Burn time: 721 seconds.
L33 second stage
34 metric tons N204 + UDMH.
Viking IV engine — thrust: 790 kN in vacuum.
Burn time: 123 seconds.
L220 first stage
226 metric tons N204 + UDMH.
4 Viking V engines — thrust: 4 × 657 kN.
Burn time: 204 seconds.
Liquid propellant strap-on booster.
37 metric tons N204 + UDMH.
Viking VI engine — thrust: 650 kN.
Burn time: 135 seconds.
Solid propellant strap-on booster.
9.5 metric tons propellant — thrust: 610 kN.
Burn time: 40 seconds.
44 LP version
2 solid
+ 2 liquid boosters
44 L version
4 liquid boosters
GTO performance with 9.6 m fairing
(satellite adaptor not included)
3740 kg
4240 kg

Design sketches for the two most powerful Ariane 4 variants.



Ariane L-10 gets under way. Seen here are two of the strap-on boosters which are being improved and uprated for use with Ariane 4. **Photo: Arianespace.**

UNTIL THE DAWN

Just what does an astronomer do during a working night at an observatory? Dr John Davies, Thermos and cheese sandwiches at the ready, reveals all . . .

Everyone knows that astronomers study the stars (well almost everyone, there are a few people who still think we cast horoscopes) but have you ever wondered exactly what astronomers do, how they actually spend most of their working day? For example, is it true that all astronomers are eccentrics? Or that they never look through telescopes? In this feature I will try to illustrate what it's actually like to spend a few nights working at a professional observatory and also give some clues as to the other activities which keep astronomers busy when they are not actually observing.

Like most other scientists, astronomers spend a lot of time behind a desk. Many hours are spent keeping up with the latest research and preparing scientific papers for publication. This work may require a lot of detailed analysis using everything from a pencil and paper to a massive computer with advanced graphic displays. As well as the paperwork, some astronomers design and build new instruments and detectors for telescopes or develop new software which can be shared via the 'Starlink' astronomical computer system. Others are involved in building and operating satellites, but that's another story altogether.

Preparing applications for telescope time is also very important, since time is awarded every few months by committees made up of a team of astronomers. These committees review all the proposals and try to decide which are most likely to produce exciting new results. There is tremendous demand for the use of the world's big telescopes so it's essential to make your applications as convincing as possible. If you are fortunate enough to be allocated observing time it will usually be necessary to prepare for a trip abroad. This is because modern astronomers require that observatories are located at the best possible sites and this has led to a move away from cloudy Britain to island observatories like Hawaii and the Canary islands. *(Oh, the hardship of it all! – ED.)*

Before leaving Britain a great deal must be done, from deciding exactly what measurements are to be made to lesser (but important) details like booking hotels and plane tickets. It is usual to arrive at the observatory a day or two before the dates allocated for your observations to allow time to recover from the journey and to check that the instrument you need is working properly. Some projects use standard instruments provided and maintained by the observatory – other astronomers bring their own specialist equipment and set it up themselves.

This sunset view is marred by the presence of high level cirrus cloud which will hamper observations. The domes are the 20in and 30in telescopes at the South African Astronomical Observatory.

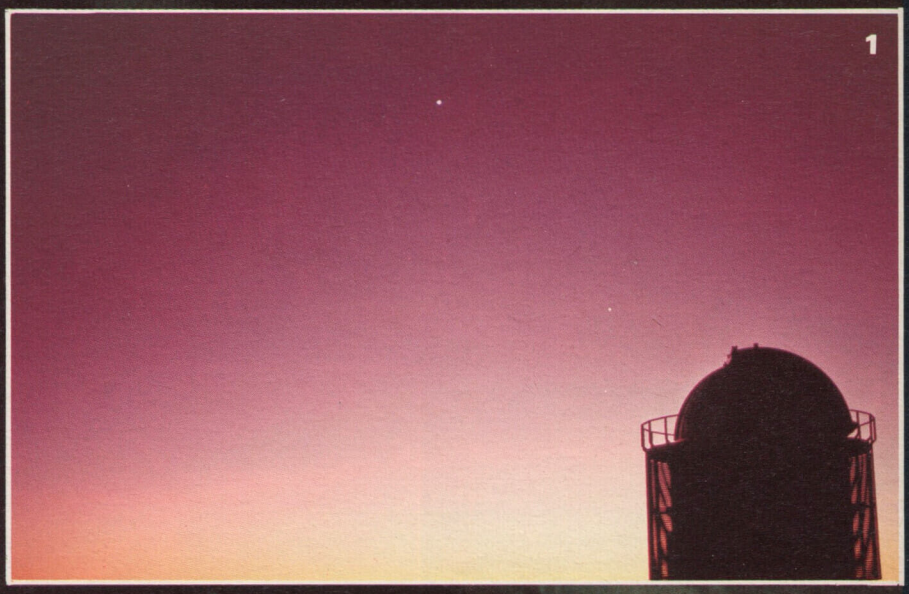
Once at the observatory, settled into the local living accommodation and with everything ready, it's then a question of waiting until the beginning of your allocated time. There is usually a chance to chat with the astronomers who are just finishing and discuss weather characteristics and any problems with the telescope. Finally, as sunset approaches, it's time for a meal, quite a big once since it may have to last all night, before gathering any last minute papers and driving up to the domes themselves. The dome shutters are opened to allow the warm air inside to escape, and then, as the sun slips below the horizon and twilight descends, it's time to begin final preparations for the night's work. The covers are removed from the telescopes and instruments switched on to warm up.

Most large telescopes are computer controlled from a room in or near the dome, smaller ones are operated by an astronomer in the dome itself. The control rooms are air-conditioned (to keep the computers comfortable) but temperatures in the dome can fall rapidly and warm clothing is usually essential if you are working at the telescope itself. The control rooms are comfortable and well lit, but working in the dome requires the use of torches and low power lamps to keep your eyes night-adapted.

Once it is quite dark then the astronomical research can begin. Some types of research involve observing the same object almost continuously throughout the night, others require that many different objects must be identified and observed for a few minutes before moving on to another. The range of different techniques and instruments is enormous,

and growing all the time. Some observations can even be done in the daytime. During the night it is usual to check actual results against those which were expected to see if anything out of the ordinary is happening; sudden changes of plan may be necessary to follow up an interesting discovery.

Big telescopes are driven to track the stars automatically but fine tuning is often required to keep them pointing exactly on target. This can either be done using a TV camera attached to the telescope and relaying a picture to the control room or by actually looking down the telescope itself. A small hand controller is used to steer the telescope, and guiding it can be quite a performance which may involve standing on a ladder in a pitch dark dome, with one eye shut and the other looking down the eyepiece, while making fine adjustments with the hand controller. One less obvious hazard is that, in the cold dry air of an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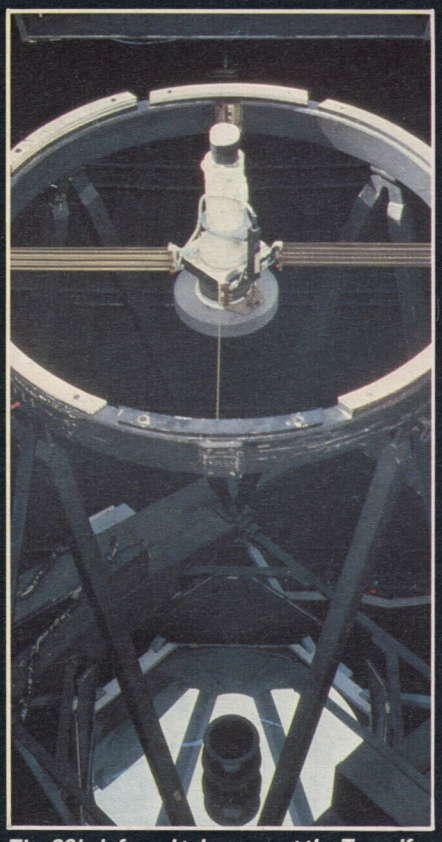
observatory, static charges can build up on your clothing which then discharge by sparking between your eyebrows and the telescope!

A full observing night can last many hours and a steady supply of coffee and sandwiches is usually essential to remain alert as the hours pass. Occasionally it may be necessary to take a walk outside to check on the weather which also provides an opportunity to spend a few minutes just gazing at the sky and enjoying the view, which can be spectacular.

Eventually the sky begins to brighten as dawn approaches. The telescopes are parked, the electronics switched off and the night's results packed away. As the Sun rises it's time to head back to your room, draw the blinds and snatch a few hours sleep. It's rather strange going to bed to the sound of the dawn chorus but after a long, busy night it's not difficult to sleep.

After a midday breakfast there is usually the chance to spend a little time relaxing and checking over the night's results before it's time to start getting ready again. Of course, by evening the sky may have clouded over and it may be impossible to start observing on time. In this case there is little to do except sit around hoping that the weather will improve. Some people use this time to work, but most just read magazines, play cards or talk. A long cloudy night can be pretty dull, and you can't go to bed until almost dawn in case it suddenly clears up.

All too quickly your time is up and the next group of astronomers are arriving. It's time to pack up, go home and start working on the results of the run. If all went well then there will be papers to write and lectures to give – if not there is always the next round of telescope time applications to think about. A foreign observing trip may sound like a holiday but it's actually very hard work. Despite what many people think, astronomy isn't an easy way to make a living . . . but it is a lot of fun. ●



The 60in infrared telescope at the Tenerife observatory. The main mirror can be clearly seen at the bottom while the mounting for the secondary mirror is visible at the top. The UK infrared telescope in Hawaii is similar in design, but much larger.

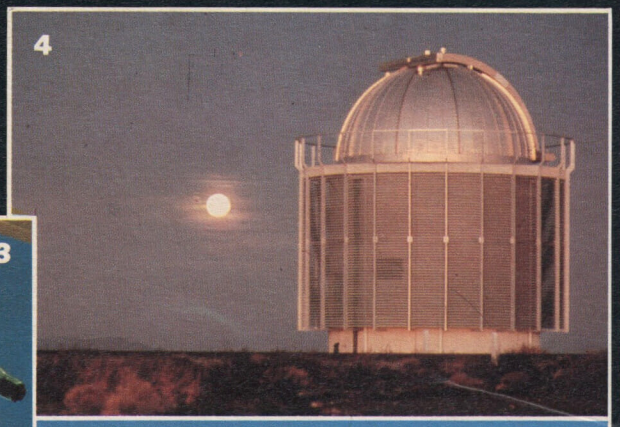
1 *Venus and Mercury are seen in the dawn sky of January 1984. The dark sky and clear horizons of observatory sites make seeing elusive Mercury fairly easy.*

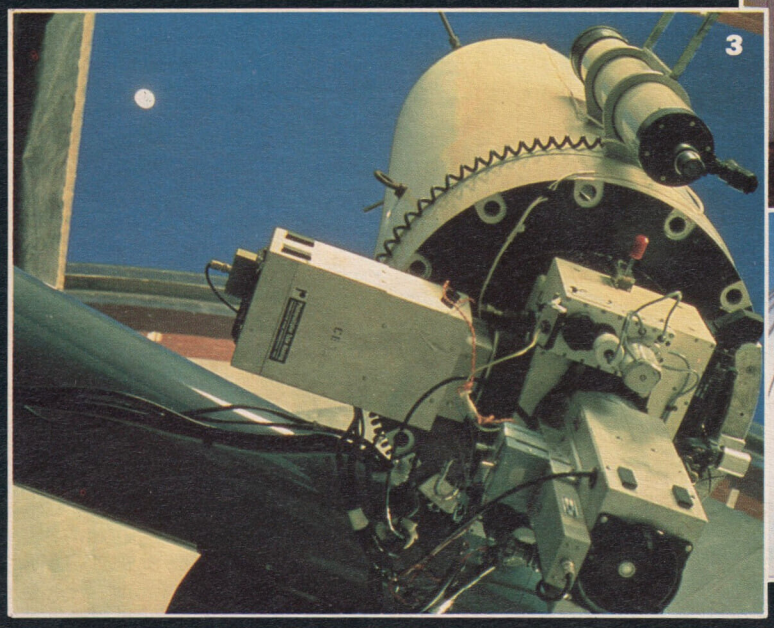
2 *A 30in telescope observing stars near the Southern Cross. An infrared detector is just visible at the base of the telescope. Instruments mounted here are said to be at the Cassagrain focus, which is easier to use than the Newtonian focus located at the top near the secondary mirror.*

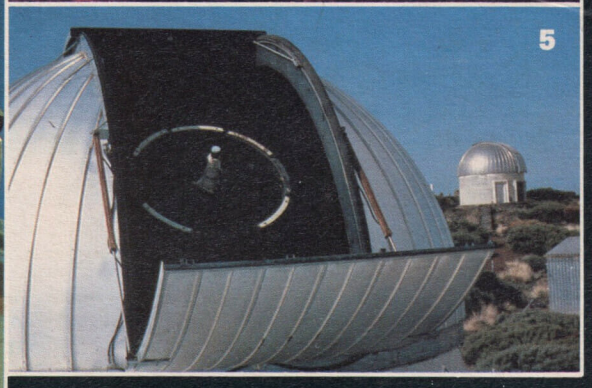
3 *This 20in telescope is fitted with two photomultiplier tubes (in the rectangular boxes) to 0make accurate measurements of star brightness, a technique called 'photometry .*

4 *Moonrise behind the dome of the 20in telescope at the South African Astronomical observatory.*

5 *Opening the protective shutters of the infrared telescope on Tenerife.*







PILOT OF THE FUTURE?

Paul Klein offers a tribute to Frank Hampson – creator of our greatest comic strip hero, Dan Dare – who died in July

Cast your mind back and forward. It's 14 April, 1950, and *The Year 1996* has just gone on sale down at the newsagent's, price threepence.

Dan Dare, Chief Pilot of the Interplanet Space Fleet, has been entrusted with a vital mission to Venus. Earth is overpopulated, threatened with global starvation. Can Colonel Dare, aboard the spaceship Ranger, find food beneath the heavy clouds of the mysterious second planet?

The weeks go by, threepence a time, and hope turns to despair. For on Venus Dan Dare comes face to face with the Mekon, ruler of the automatic Treens and would-be dictator of the Solar System. Dan Dare has a lantern jaw and the stiffest of upper lips. The Mekon is green, possesses a giant brain and a totalitarian streak a light year wide . . . The two are natural enemies, their all-colour clash is a corker, the other stories ain't bad, and threepence follows threepence for the most popular weekly comic ever published in England.

The universe of Dan Dare was dreamt and drawn by the late Frank Hampson. Born in the Audenshaw district of Manchester in 1918, he was schooled in Southport, but left at 14 to become a Post Office telegram boy. He'd already revealed a distinctive gift for art, but it was to be some time before he could perfect his skills. Mind you, he laid down a marker for the future in the same year, 1932, when his first published cartoon appeared in *Meccano Magazine.*

Hampson attended evening classes at the Southport School of Arts, and in 1938 he made the decision to resign from the Civil Service and become a full-time art student. But the war intervened – he served with the Royal Army Service Corps – and in 1946 he tried again, this time successfully, supplementing his grant with a few extra shilling paid for contributions to a local religious periodical called *The Anvil.*

The Anvil was edited and published by Marcus Morris, the vicar of St James's church, Birkdale, just outside Southport. Author of an article called 'Comics Which Bring Horror Into The Nursery', a wary look at the rapid spread of American strip-cartoons on this side of the Atlantic, Morris was nurturing ambitions to spread the *Christian* message using the same medium. Morris discussed his idea with

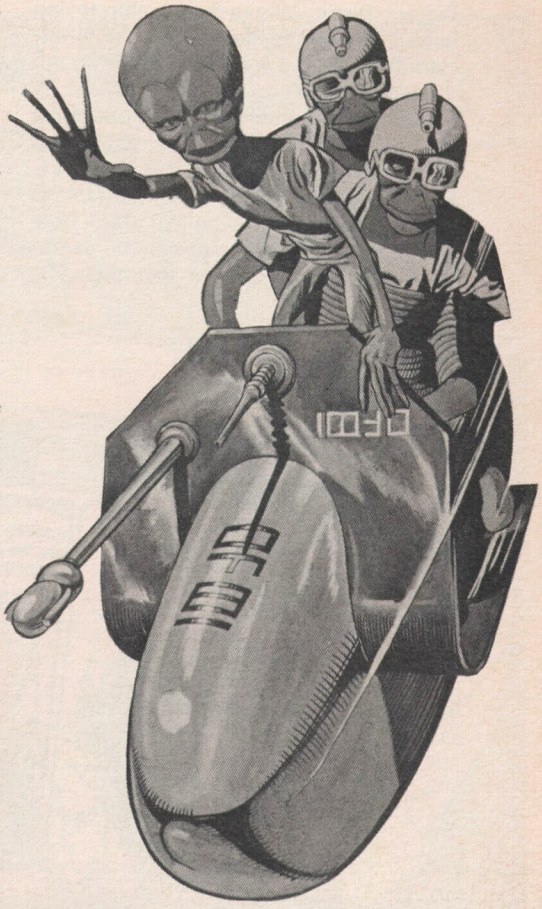
Hampson, and together they put together a dummy issue. Frank's wife, Dorothy, supplied the name, suggested by the lectern in St James's.

The comic, of course, was *Eagle*. Morris wandered up and down Fleet Street, to little effect, until the comic was finally accepted by Hulton Press, publishers of the famous *Picture Post*. Shrewd judgement on their part, because the first issue was an instant sell-out, forcing a hurried re-print: in the end a million copies were sold. *Eagle*, a curious mixture of derring-do, Biblical tales, Western gun-slinging and life-stories of saints, missionaries and philanthropists, was literally an overnight success, and front-page hero, Dan Dare, became a national institution.

But the search for an unmissable, cliff-hanging adventurer had proved a difficult one. First there was Lex Christian, a tough parson working in the slums of East End London; then Hampson tried a heroine, a lady detective called Dorothy Dare; next came a trouble-shooting flying padre, an airborne answer to all sorts of moral problems. Finally, though, he settled on a space story: Hampson had seen Werhner von Braun's V2 rockets fall on London during the latter days of the war; he knew space travel was just around the corner. The result was *Dan Dare: Pilot of the Future.*

Dan Dare, along with Hampson's other strips – in the early days of *Eagle* he was amazingly prolific – was brilliantly cinematic in style, a feature film on paper. A high degree of realism, strong characters, crisp dialogue, pace, quick cutting, breath-taking panoramas, stunning backgrounds, clever use of angle to suggest mood or emotion . . . it all added up to a new kind of comic strip.

Arthur C Clarke was science consultant, and Hampson built scale models of spacecraft and hardware to ensure that his work was always accurate and correctly detailed. His characters were based on friends and relatives. Colonel Daniel McGregor Dare was an idealised version of Hampson himself; he said he was everything he wanted to be: fearless. decisive, a born leader. His firm jaw and perpetually raised eyebrows were clues to his courage and scepticism; however, they also ensured that Dan Dare was instantly recognisable, even behind a space helmet! Sir Hubert Guest, Marshall of Space, was the artist's father; and



Above, the Mekons, Dan Dare's arch enemies. Left, the firm jaw and raised eyebrow of Colonel Daniel McGregor Dare.

All pictures courtesy of and Copyright IPC Magazines.

Digby, Dan's Wigan-born, chip-loving batman, was modelled on Harold Johns, Hampson's friend and fellow *Eagle* artist.

Hampson wrote and drew for all he was worth as *Eagle* went from strength to strength. But there, in a sense, lay his undoing. He never thought to negotiate any copyright or royalty agreement for his creation. Merchandising of Dan Dare products – uniforms, spacesuits, toothpaste, film shows, braces, you name it – made millions of pounds. But Frank Hampson, in love with his work and his hero, simply drew a salary.

In 1960 *Eagle* was sold off, first to Odhams Press, then to IPC. By now times had changed and Dan Dare was removed from the front page. Hampson, having lost artistic control, left the comic, disillusioned and saddened; from then on his health declined. He suffered two strokes, which put an end to his drawing, and he was found to have cancer. He died on July 9 this year.

Many people justifiably believe that comics are just comics, and largely trivial. But in *Eagle*, and especially in the stories of *Dan Dare: Pilot of the Future,* you can see the work of a truly original talent. ●

FRANK HAMPSON
1918-1985

Another Hampson creation was Tommy Walls, an advertising strip for Walls Ice Cream.

THE GREAT ADVENTURER
1900 YEARS AGO. SAUL OF TARSUS ARMED WITH THE HIGH PRIESTS COMMISSION TO ARREST ALL NAZARENES (CHRISTIANS) DRIVES HIS MEN ON UNDER THE HOT SYRIAN SUN.
DAMASCUS AT LAST!
PERHAPS WE'LL GET SOME REST NOW
NOT IF I KNOW SAUL— WE'LL BE CHASING NAZARENS AS SOON AS WE REACH DAMASCUS
YOU'D THINK THE WHOLE WORLD DEPENDED ON US GETTING THERE. I'VE NEVER RIDDEN SO HARD IN MY LIFE!
OH—HE CAN'T BEAR TO THINK OF ANY NAZARENES SLIPPING THROUGH HIS FINGERS!

Above: the Christian content of* Eagle *included this story of St Paul, by Hampson.

METROPOLITAN POLICE ESCORT SHIP
CONTROLLER TO H.Q— PRIORITY! —CLEAR ALL AIR LANES AND SPACE-WAYS! COLONEL DARE AND I TOUCH DOWN IN TWO MINUTES.
THAT'S THE A-PLUS ALERT THEY'RE SOUNDING, DAN.
USED ONLY FOR APPROACHING ENEMY SHIPS OR IMMINENT METEORITE BOMBARDMENT, SIR!
WHEEC
WHAT'S THE FLAP, MAJOR?
A COMPLETELY UNKNOWN TYPE OF SPACESHIP, SIR . . .
. . . IT PENETRATED THE OUTER OBSERVATION BELT AND ARRIVED *INSIDE* THE PERIL PERIMETER *WITHOUT BEING SPOTTED!*
BUT THAT'S NOT POSSIBLE *UNLESS* . . .
UNLESS *WHAT?*
NO! THE WHOLE IDEA'S TOO FANTASTIC . . .
THERE IT IS! WE'VE GOT IT IN THE 3D VIEWER NOW.
JUMPIN' JETS! WHAT *IS* IT?
NOTHING FROM ANY PLANET IN THE SOLAR SYSTEM, I'LL SWEAR!
COURSE STEADY AT XC 64 — LA 281.
18,700 MILES— 18,600 MILES — 18,500 MILES . . .
SPEED REDUCING, NOW 3,060 M.P.H.
I TELL YOU, SIR — THAT THING SUDDENLY APPEARED IN THE CENTRE OF THE VIEWER FROM *NOWHERE!* IT'S — IT'S BLACK MAGIC, SIR!
PULL YOURSELF TOGETHER! THERE *MUST* BE SOME SCIENTIFIC EXPLANATION.
AND I THINK I KNOW WHAT IT IS— THOUGH THE BOFFINS WILL SAY I'M STARK, STARING MAD! LET'S GET UP TO THE STELLARIUM AND VIEW THE PICTURE AS A WHOLE!

MOON IN ECLIPSE

Patrick Moore considers the often misunderstood eclipse of the Moon

Something very interesting is going to happen on the evening of Monday, 28 October. If the skies are clear, we will see a total eclipse of the Moon.

As almost everyone knows, the Moon moves round the Earth, while the Earth moves round the Sun. (To be absolutely correct, the Earth and the Moon move together round the 'barycentre', or centre of gravity of the Earth-Moon system; but since the Earth is 81 times as massive as the Moon, the barycentre lies deep inside the Earth's globe, so that the distinction is not important to anyone except a mathematician.) Therefore, there must be times when the three bodies move into a straight line. If the Moon is in the mid position, it blocks out the brilliant disk of the Sun, and we see a solar eclipse; by a lucky chance – it is certainly nothing more – the Sun and the Moon appear virtually the same size in the sky, so that the Sun can just be fully covered.

A total solar eclipse is the grandest sight in all nature, but unfortunately the Moon's shadow is barely long enough to reach the surface of the Earth, so that as seen from any particular site, total eclipses are rare. The last to be visible over any part of England was that of 1927, while the next is not due until 11 August 1999.

But suppose the Moon is on the far side of the Earth with respect to the Sun. It then passes into the shadow cast by the Earth. It depends upon sunlight, and so its supply of direct illumination is cut off – and the Moon becomes very dim until it passes out of the shadow again.

There are several points to be noted here. First, the Moon does not (usually) disappear completely; some of the Sun's rays are bent or refracted on to its surface by way of the layers of atmosphere surrounding the Earth. Secondly, a lunar eclipse is a much more leisurely affair than an eclipse of the Sun. A total solar eclipse can never last for as long as 8min and most are much shorter, whereas the Moon may be totally eclipsed by the Earth's shadow for as long as 1hr 44min. And thirdly, a lunar eclipse is visible from any part of the Earth from which the Moon is above the horizon at the time. Thus from any particular site, eclipses of the Moon are more frequent than those of the Sun.

Let us look more carefully at the geometry of a lunar eclipse. The Moon is, on average, about 239,000 miles away, and the Earth's cone of shadow is much longer than that; its mean length is as much as 850,000 miles – over three times as far. At the distance of the Moon, the cone of shadow has a diameter of about 5700 miles, and it may take the Moon some time to pass through. But the Sun is not a point source of light; it is a disk, and so the main shadow-cone or 'umbra' is surrounded to either side by a zone of partial shadow, or 'penumbra'. Not all lunar eclipses are total, and there are also times when the Moon misses the umbra completely. A penumbral eclipse is by no means obvious, though it is easy enough to detect if you are looking out for it. Also, the Moon must pass through the penumbra before it can enter the main cone of shadow.

Next, why do we not see a lunar eclipse at every full moon, and a solar eclipse at every new moon? The reason is that the Moon's orbit is tilted to ours by an angle of just over 5 degrees. When new, the Moon usually passes unseen either above or below the Sun in the sky, and when full it usually avoids entering the Earth's shadow. But for this, we would have eclipses every month; after all, the Moon takes only 27.3 days to complete one orbit.

Now let us see what will happen on the evening of 28 October this year. The first thing to see will be a slight dimming as the Moon passes through the penumbra, but this will not be visible from Britain simply because the Moon will not have risen. When it appears above the horizon, it will already be partially eclipsed in the main cone. By 1720hr GMT the period of totality will begin, and will last until 1804hr. Then the shadow will start to retreat; you will be able to see it creeping back over the Moon's surface, and the main eclipse will end at

1929hr, by which time the altitude will be reasonably good. There will be a further period when the Moon moves out through the penumbra and the whole phenomenon comes to an end.

It will be very interesting to watch the various colour effects during the eclipse. And lunar eclipses are by no means all alike. Very often there are lovely greens, yellows and reds over the Moon's disk; at other times the Moon simply turns a coppery colour, and there are also eclipses when the Moon disappears. Records of this go back a long way. There were two total eclipses in the year 1620, one of which was watched by the great astronomer Johann Kepler, and from all accounts the Moon vanished; the same thing happened at the eclipse of 1642, while in 1761 the Swedish astronomer Per Wargentin wrote that the Moon disappeared so completely that for a time it could not be located even with a telescope.

volcanic eruption in the East Indies, and the upper air was laden with dust and ash.

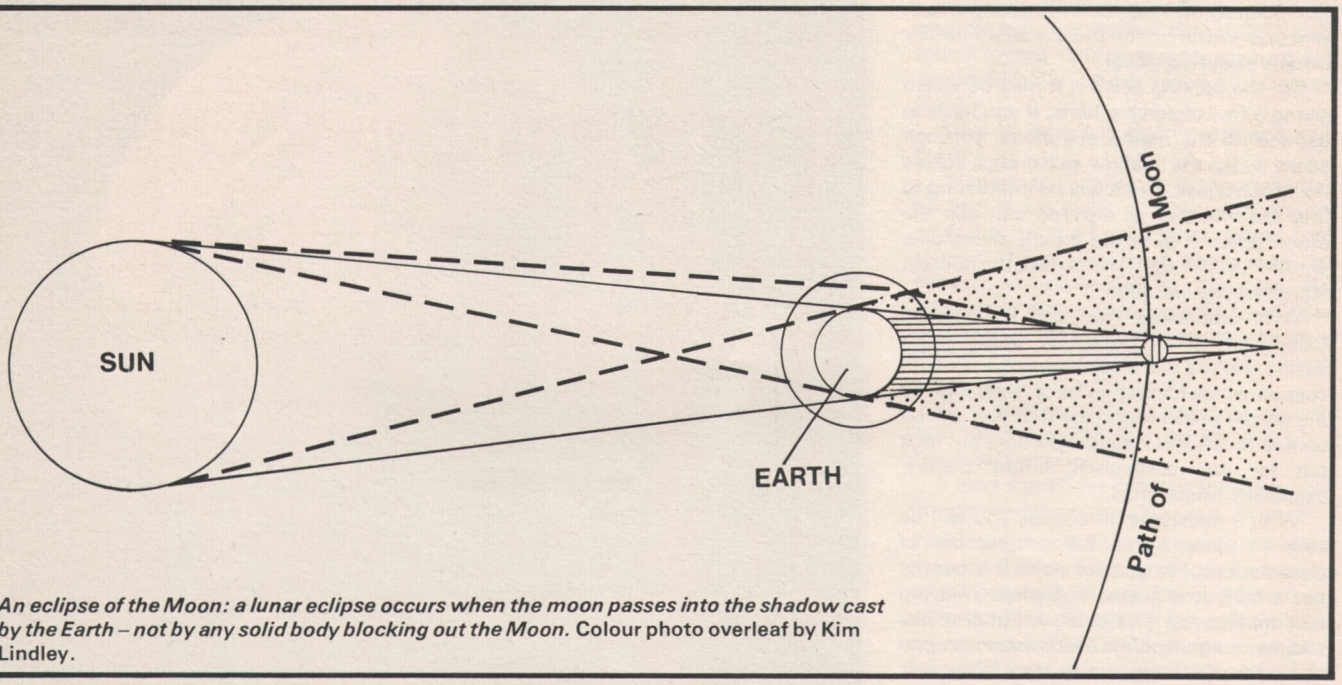
There are various useful observations to be carried out on 28 October. First, if you have a telescope (or a pair of good, well-mounted binoculars), note the times at which various lunar craters and mountains are covered by the encroaching shadow, and uncovered again after totality. Secondly, make a record of the colours, if any – and if you have the chance, take some photographs; they can be really beautiful. Also, a watch should be kept on some special craters, because it has been suggested that an eclipse may have detectable effects on them.

Remember, once the sunlight is cut off, the temperature of the lunar surface falls dramatically. The Moon has no atmosphere, and the surface materials are very poor at holding on to warmth, so that a 'wave of cold' sweeps over the Moon – during one eclipse it was found that the temperature

Serenitatis or Sea of Serenity. Linné is a craterlet surrounded by a white patch. It used to be thought that this white patch might be due to something akin to hoar frost, in which case it might be expected to increase in size when abruptly cooled. Various observers have reported precisely this effect in the past, but again I have never been able to do so – and thanks to the results of modern investigations (including the Apollo probes) we are now quite sure that there is no hoar-frost on the Moon. Nothing of the sort can be found on a totally airless world. All the same, it will be worth keeping a careful eye on Linné to see whether any unusual effects can be noted. Look also at the very dark-floored craters, such as Plato and Grimaldi.

Frankly, I am sceptical; I will be very surprised if anything unusual is seen – but I suppose one can never be sure.

Records of lunar eclipses go back a long way, and there is even a Middle East report



An eclipse of the Moon: a lunar eclipse occurs when the moon passes into the shadow cast by the Earth – not by any solid body blocking out the Moon. **Colour photo overleaf by Kim Lindley.**

Other exceptionally dark eclipses were those of 1816 and 1884. On the other hand, the eclipse of 19 March 1848 was so 'bright' that some observers refused to believe that an eclipse was happening at all. I have seen a dozen total eclipses by now, and there have been several occasions when the Moon became very difficult to see with the naked eye – and the stars shine out in their full glory. (Incidentally, there should be a superb spectacle on 24 April 1986. The Moon will be totally eclipsed – and this is the time when Halley's Comet will be on view. Unfortunately you will have to go to the southern hemisphere to see it.)

Obviously, the differences in lunar eclipses have nothing to do with the Moon itself; everything depends upon the state of the Earth's air – because all the sunlight reaching the eclipsed Moon has to pass through our atmosphere first. For example, the 1816 eclipse was unusually dark because there had been a tremendous

fell from 160 degrees Fahrenheit to −110 degrees in only an hour. Yet not all parts of the Moon cool down at the same rate. Using infra-red techniques, it has been found that there are some regions – notably the 54-mile crater Tycho, which is the centre of the Moon's most prominent system of bright eays – which cool down much more gradually, and are known, rather misleadingly, as 'hot spots'. The cause here lies in some unusual surface composition.

One of the most interesting craters on the Moon is Aristarchus. It is only 23 miles in diameter, but it is very bright – so bright, indeed, that it can often be seen by earthlight alone, and on more than one occasion it has been mistaken for an active lunar volcano! There have been suggestions that it brightens up immediately after an eclipse, though I admit that I have never been able to see any sign of this myself.

There is also the small formation known as Linné, on the greyplain of the Marc

dating from 3450 BC which may be fairly definite. Moreover, the ancient star-gazers could predict eclipses with some degree of accuracy. It so happens that the Earth, Sun and Moon return to almost the same relative positions in a period of 18 years $10\frac{1}{4}$ days – so that an eclipse is likely to be followed by another eclipse 18 years $10\frac{1}{4}$ days later, a period known as the 'Saros'. It is not perfect, but it is a great deal better than nothing. Today, of course, we know the movements of the Sun and Moon so well that both solar and lunar eclipses can be predicted accurately for centuries in advance if need be.

Two eclipses have even had a marked effect upon human history. One of these was that of 413 BC. In Greece, a major war was raging between the two most powerful city-states, Athens and Sparta. The Athenians had sent an army to invade the island of Sicily; things had not gone well for them, and it was obviously wise to leave the island

as quickly as possible. The Athenian fleet was ready to set sail, but it so happened that the Moon eclipsed, and the Athenian commander, whose name was Nicias, interpreted this as a divine warning to stay where he was. By the time he did decide to make a move, it was too late. The Spartans launched a sudden attack; the whole Athenian army was wiped out – and eight years later Athens itself had to surrender.

The story of the 1504 eclipse is more cheerful. Christopher Columbus was in a ship lying off the coast of Jamaica, and difficulties arose when the local inhabitants refused to supply him with food and water. Unlike Nicias, Columbus knew a great deal about lunar eclipses, and he remembered that one was due on 1 March, a day or two ahead. He therefore told the Jamaicans that unless they mended their ways he would make the Moon 'change her colour, and lose her light'. When the eclipse duly began, the natives were so alarmed that they immediately elevated Columbus to the rank of a god – after which there was no further trouble about supplies!

For the coming eclipse, it may be worth giving a few observing hints. If you have to depend on the naked eye alone, you can easily watch the shadow as it creeps across the Moon's disk, and it will be interesting to find out whether or not you can see the Moon when it is in the middle of eclipse, around 1820hr GMT. Note, too, the faintest stars that you can see.

With binoculars, you will be able to follow the shifting shadow much more easily, and you will also make out any of the colours which happen to be on view. During the partial phase it may be that you will be unable to see the eclipsed portion, but look out for any particularly bright craters, especially Aristarchus.

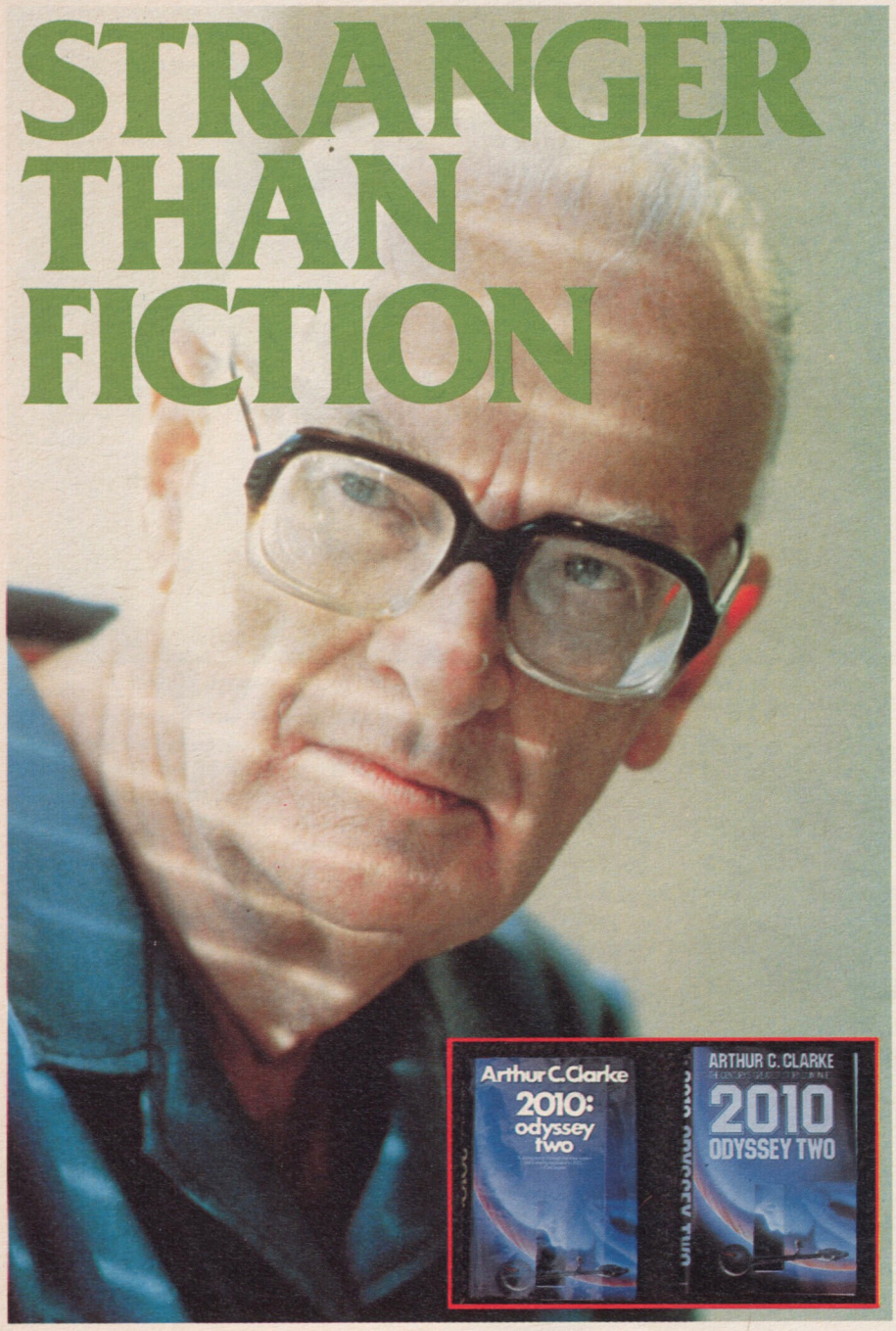
With a telescope, of course, you will be able to carry out a full programme of observations. For general views it is best to use a fairly low power, but when studying definite features it is obviously better to use a higher magnification. Much depends upon the state of the sky – and remember, too, that you cannot hope for really good results until the Moon has risen well above the horizon.

There is great scope for photography. It is very interesting to take a whole series of pictures, showing the eclipse in its various stages; use a fairly fast film (unless you have a clock-driven telescope), so that you avoid any 'trailing' due to the Moon's movement across the sky. Colour films are quite suitable, though only if conditions for observation are good; if they are not, my advice is to keep to black and white.

This will be the last lunar eclipse of 1985. There will be two in 1986, both total; one on 24 April – which is unfortunately invisible from Britain, though, as I have said, it will be seen from the southern hemisphere at the time when Halley's Comet is on view. The next will be on 17 October, when totality will last for 1hour 14min, and the whole phenomenon will be visible from here. But 1987 is a poor eclipse year; there will be a partial on 7 October, but as only 1% of the lunar surface will enter the main cone it will not be very spectacular. Then 1988 provides one eclipse, on 27 August (partial: 30% of the Moon covered) and there will be two in 1989, on 20 February and 17 August, both total.

It cannot be claimed that an eclipse of the Moon is anything like so spectacular or so important as a total eclipse of the Sun. All the same, such eclipses are well worth watching – so let us hope for clear skies on 28 October. Even to the casual observer, an eclipse of the Moon has a dim, ghostly beauty all its own. ●

STRANGER THAN FICTION



Neil Gaiman talks to Arthur C Clarke and discusses, among other things, a certain film....

Getting to meet Arthur C Clarke is not easy. He has lived in Sri Lanka for the last 25 years, secure in his position as one of the three best-selling science fiction writers in the world, and, as far as hard technical extrapolation goes, he is probably the best there has ever been. It was Clarke who predicted satellite communications years before Telstar (and thus made the concept unpatentable). And as the co-creator of *2001 – A Space Oddyssey,* with Stanley Kubrick, he made one of the first major influential science fiction films.

Earlier this year, however, he was in England for the premiere of *2010,* Peter Hyam's film of Clarke's book, a sequel to *2001*, and it was in his room in Brown's Hotel in London that I caught up with him. He is 67, amiable and always interesting. So how did he feel about the film of *2010*? Was he happy with itt?

'I think Peter Hyams has done a very remarkable job. And he's had to face the comparison with *2001*, which is very unfair as it was made in a totally different era. We've had nearly two decades of fantastic achievement since then. We're able to show things in this movie that would have been impossible then. For example, when you see Jupiter in *2010* it's the real thing. The Voyager fly-by produced these marvellous pictures of the moons of Jupiter and of Jupiter itself. We've taken them and massaged them with $250,000 worth of computer time, so everything you see there is real. We'd just change the perspective and animate it into action, but basically what you see is real.

'Do you know about my computer link with Peter Hyams? I sat in Colombo with my computer and he had an identical set-up in Hollywood. During my day I'd load my comments in a file and number them, and then just before I went to bed – 9.30pm Sri Lankan time, 7.30am his time – I would call up his machine and send my file. Then I'd type 'HELLO' and if I got 'HI' back, we'd chat to each other.

'And I found something very extraordinary – for the first time in 20 years I found myself writing letters again. It's all documented in a book called *The Odyssey File.'*

Does he have any reservations about the film?

'None at all. I mean, he dropped a whole section of the book, as he had to do, and what he dropped was what would have slowed things down or have been too difficult or expensive to film. He also introduced things that were his own ideas, and some of them I think were very good – if I'd have thought of them myself I might have used them in the book!'

So is there going to be a second sequel? I had heard rumours mentioning *20,001 – The Final Odyssey . . .*

'I have signed the contract for the sequel. But on my own terms. You see, as soon *2010* was finished they got onto me about the sequel. They kept sending me contracts which I kept tearing up. Then I knew I was going to New York, and my agent's goon squad would be waiting for me, so I launched a pre-emptive strike. I said I want to write another novel called *The Songs of Distant Earth*, and that's what I'm doing first, come hell or high water, so I'd contract for two books, that one first and *Odyssey Three* to be second. My terms were that I wanted an advance of 10 cents on the first book (less and I couldn't pay the agent's commission) and, allowing for inflation, a dollar for the second book.

'I don't even start *thinking* about the next *Odyssey* until August 1988, as that is the month that Galileo 8 is due to fly through the moons of Jupiter. Then we'll have months of continuous coverage, in real detail, of what these places are like. I *could* write it now, but I'd look a damn fool in 1988 if Galileo went there and showed I was totally wrong. So I'll wait and see. If Galileo fails – and Heaven forbid, as it is the last big space mission of this century – if it fails I'll know that in my lifetime we won't have another mission to Jupiter and I can use my imagination. But if it succeeds there'll be input: *2010* couldn't have been

written without the Voyager mission, as it showed what weird worlds these moons of Jupiter are.'

So what originally impelled him to write *2010: Odyssey Two,* after two decades?

'Well, one of the inputs was the outburst of space movies, *Star Wars* and so on, which interested me as so much could be done technically. It was purely an intellectual challenge – how *could* one write a sequel to *2001*? I'd always said it was impossible.

'So I wrote a movie outline, just to see if it could be done. (A movie outline is a bastard form . . . it's like a musical score, neither one thing nor the other. The beauty of a movie outline is you can encapsulate an entire novel without the drudgery of producing several hundred pages of deathless prose.) I hoped that by doing this I could get it all out of my system and forget all about it.

'I sent a copy to Stanley Kubrick as a courtesy, although I knew he wouldn't be interested, and I sent a copy to my agent, thinking he'd send it to *OMNI* and I could forget all about it. I thought I'd purged and exorcised it. But he sent it straight back and said, "You've got to write the novel!" I cursed, until I realised that I *did* want to do the novel. The money didn't do any harm, either.'

How does he feel about the current crop of SF movies?

'I try to see them all, and there has been some first rate stuff. I enjoyed *Close Encounters . . .* and *Star Wars. Alien* I was also very impressed by, and they're a challenge. Can you do better? I thought *Dune* was a tremendous achievement – cinematographically brilliant, but I think it would present problems for anyone who hadn't read the book.'

Scenes (above and below) from* 2010. *The contract for the final sequel,* 20,001, *has already been signed.

I suggested that perhaps they had tried to squeeze too much into a $2\frac{1}{2}$hr movie.

'Yes. Exactly. In *2010* Peter Hyams threw away everything that was irrelevant or complicated, and took just the basic storyline. In *Dune* they tried to put in too much. They deserve credit for what they tried to do, and it's a rare film that gets faulted for being *too* faithful to the book!'

As someone who has done more than his share of prediction, how does he see the future of man in space, over the next 100 years?

'Well, I think we should be back to the Moon before the end of the century, and have established a permanent base there. But Mars is where the action is. A fascinating world. It's got water, which the Moon hasn't (it's not free water, but ice), it's got a little atmosphere, it's as big as the Earth, and I'll be very surprised if it doesn't turn out there was life there at some time in the past. The dry river valleys mean that enormous quantities of water flowed there hundreds of millions of years ago, so I think life is likely, and it could be hanging on in dark corners. Don't write-off Mars.

'And it's a gigantic universe out there – recently they discovered life in the Galapagos trench, with temperatures of over 500 degrees. Everyone thought that was utterly impossible. If there's one develop-

Arthur C Clarke during an interview for BBC's* Horizon *in 1977.

ment in the space program I'd *like* to see, that would be it. Communication with ETs, or detecting them, or finding artifacts and remnants.'

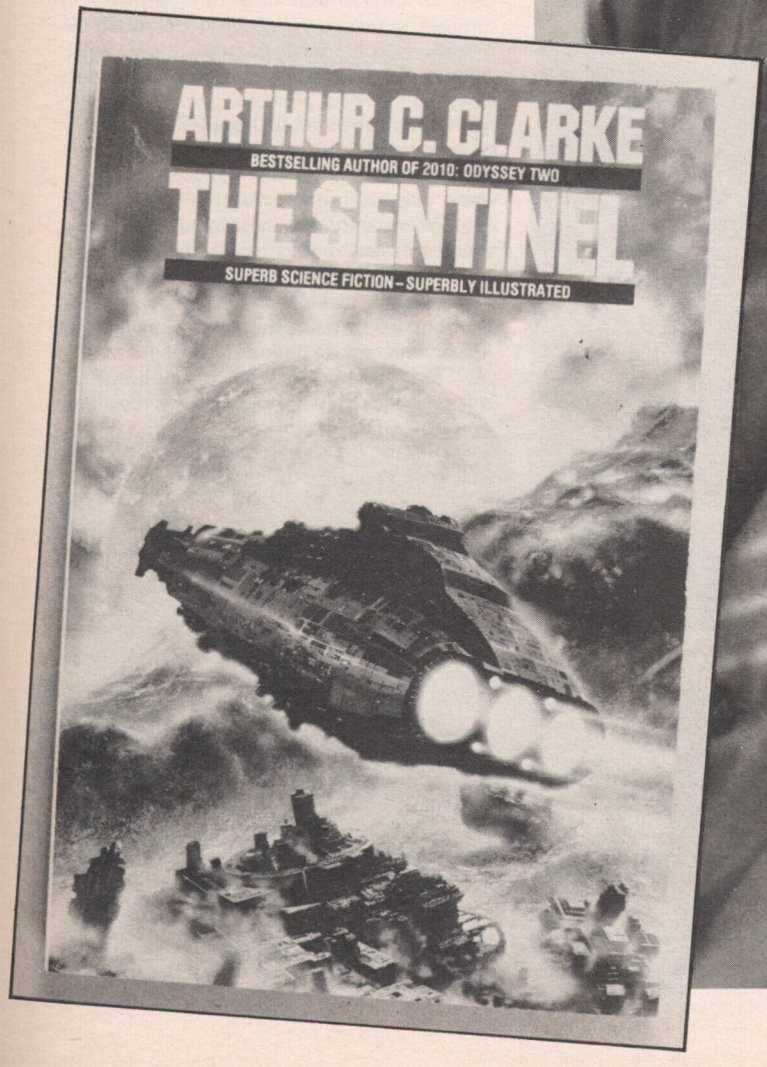
In his 67 years, is there anything he hasn't done that he wanted to?

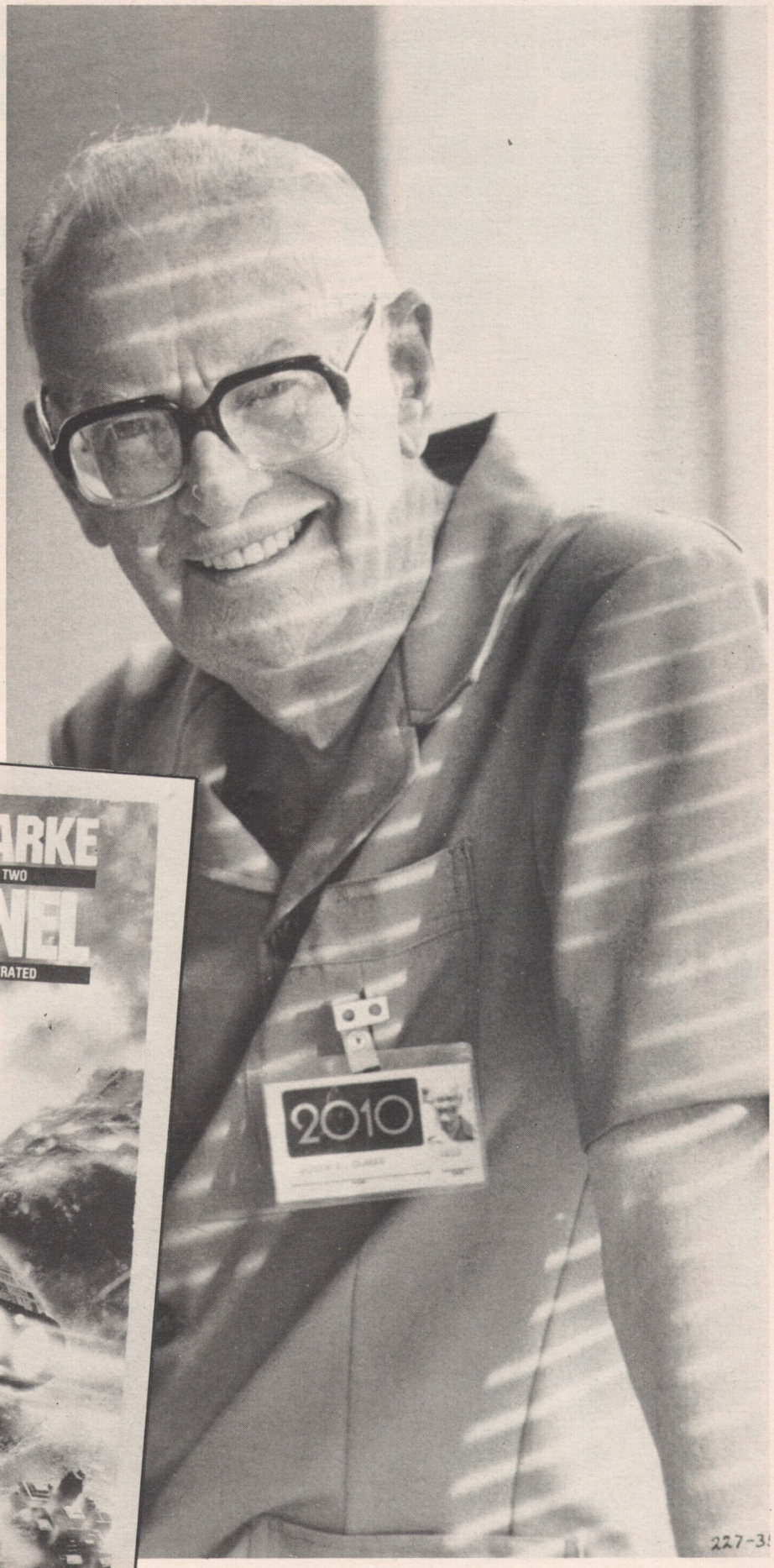
'*Yes!* You see, I was recently on the Committee to choose passengers for the Space Shuttle. I dropped a few hints . . . but I won't be going. I wish I could.

'I remember, back in the '40s, I was at a meeting of the British Astronomical Society round the corner. One meeting, I watched them showing pictures taken of the Moon through their telescopes, and I said, 'One day we'll be seeing pictures taken on the spot'. But I never believed it could happen in my lifetime.'

He paused, to reflect. 'You know, I've been incredibly lucky . . .'

Arthur C Clarke's publications are too numerous to list – over 30 works of fiction and about the same number of works of non-fiction. His most recent publications include *The Sentinel* (Granada £2.99), a large format, illustrated collection of his best short fiction (including the move outline for the soon-to-be-novelised *Songs of Distant Earth),* and *1984: Spring. A Choice of Futures,* a collection of essays (Granada £2.50).





PROJECT MERCURY

Revisited

Terry Bunting begins a new series in which we look back at some of the great historical missions of the past. To start us off, we recall the drama of America's first manned space programme which inspired the film *The Right Stuff* – Project Mercury

Successful manned space flights rarely provoke human interest these days, their achievements being more scientific than spectacular. While physicists, biologists, and certain industries eagerly await mission results, the public seem to have adopted a 'seen it all before' attitude.

Ironically, just 25 years ago, the very thought of a human being travelling in space, and of the public being able to follow his progress, stirred the emotions of millions of people. Of course, the Russians and Yuri Gagarin did it first, but the (then) newly formed NASA's policy of allowing mass media coverage enabled everyone to share the drama associated with America's first manned space programme: The Mercury Project.

Mercury's purpose was threefold – put a man into space; allow him to carry out scientific tests; and, most importantly, return him safely back to Earth. Even though the early automatic satellites could, and did, carry out complex investigations with no risk to human life, NASA knew that manned missions would generate massive public interest, enough to ensure healthy financial support from Congress. Part of this budget would, however, have to be spent on an intensive selection and training programme, as the space pilots would undergo hitherto unknown stresses during a mission.

So just what did NASA ask of a prospective Mercury Astronaut? The initial criteria,

drawn up in the 1950s stated that the successful applicant should be:

1. Less than 40 years of age.
2. Less than 5ft 11in in height.
3. Physically fit.
4. A Bachelor of Engineering, or its equivalent.
5. A qualified jet pilot.
6. A graduate of a test pilot school.
7. Possess at least 1500hr flying time.

For reasons of National Security, only military personnel were eligible; although in later years less stringent ruling allowed a wider range of people, including civilians, to be considered.

Having met these demands, the candidate's entire medical history was inspected and recorded on computer cards. He would then undergo the most comprehensive examinations ever devised, to prove his fitness for space travel. Every conceivable flight situation was simulated in ground laboratories. The would be spaceman was baked, frozen, spun, pressurised, de-pressurised and shaken, to test his body's ability to compensate. IQ tests and mental problems were set in an atmosphere of flashing lights and deafening noises. Long hours in a soundproofed chamber measured his reactions to solitude. Doctors attempted to disorientate him mentally and physically, using rotating chairs with panel controls that speeded up to beyond his capability to operate them.

Five hundred men volunteered for this, sometimes torturous, screening regime; seven were selected. On 9 April 1959, in a blaze of publicity, astronauts Carpenter, Cooper, Glenn, Grissom, Schirra, Shepard and Slayton were introduced to the World.

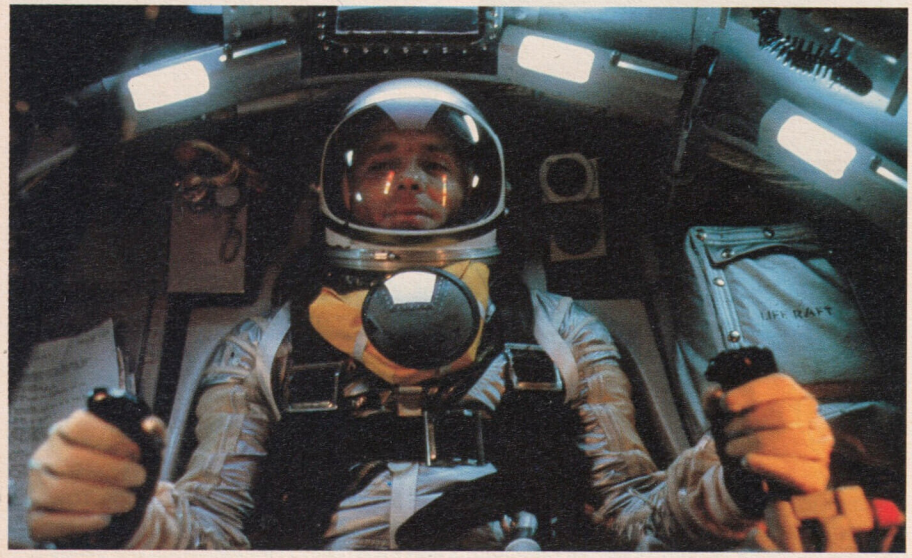
During the next two years they would attend classes on astronomy, flight mechanics, meterology, communications, aerodynamics and navigation. They would practise flight simulations, including emergency procedures such as underwater escape from a sinking capsule, and survival techniques in case a returning spacecraft accidentally landed in a hostile environment.

The 1½-ton Mercury capsule itself was built by McDonnell; the coal-black funnel shaped craft was 9ft 4in high, with a base diameter of 5ft 11in. The narrow 19½in diameter cylindrical front section was covered by an ogival shaped nose cone to lend aerodynamic properties during launch and ascent. On the base, a jettisonable retro-rocket pack was fixed across the ablative heat shield, which consisted of nylon, silicon fibres and asbestos.

Inside Mercury's tiny cabin, banks of instruments would relay information on the spacecraft's condition, while automatic systems would take control away from the pilot during periods of great acceleration and turbulence. Life support apparatus provided an oxygen atmosphere at 75 degrees Fahrenheit for the astronaut, who would lie on a specially moulded couch, designed to minimise acceleration forces.

By the Spring of 1961, 14 test launchings had been completed, some of the flights carrying monkeys as passengers. But the many Americans following Mercury's progress with great interest were dealt a crushing blow when Gagarin's orbital flight made history on 11 April. NASA answered the resulting criticism just three weeks later, as Alan Bartlett Shepard became their first spaceman.

Bad weather had forced launch cancellations on the 2nd and 4th of May, but at 0934hr on the 5th, a Redstone rocket carrying Shepard's capsule – which he had named Freedom 7 (or Mercury 3) – rose into the cloudless skies above Cape Canaveral. During the ascent, Shepard experienced acceleration forces over six times that of gravity (6 g). His eyeballs were pushed painfully back into their sockets, and this, coupled with an enormous amount of buffeting, made instrument interpretation impossible. Yet once in space he no longer felt any pressure as unsecured objects floated freely around his cabin. This zero-g state lasted for 6min, giving him time to alter the capsule's pitch and yaw with tiny joystock-controlled thrusters. By now, the craft was travelling heat shield first, and Shepard switched back to auto-pilot for re-entry. The retro rocket pack fired perfectly, and Freedom 7 landed safely in the sea close to the recovery carrier Lake Champlain, 288 miles from the launch pad.



Chuck Yeager acted as technical consultant during filming of* The Right Stuff, *and was portrayed by Sam Shepard.

Although critics labelled the flight a 'flea hop' when compared to Vostok 1, an estimated 45million Americans followed Alan Shepard's 16min trip on TV, while 10 times as many listened on radio. There were also 350 pressmen present at Cape Canaveral – a marked contrast to the secrecy and scepticism surrounding the Soviet mission.

Three days later, New Hampshire-born Shepard received the Distinguished Service Medal from President Kennedy. The 37-year-old Navy Captain had become a national hero, but his apparent aloofness – he was fiercely proud of himself and his achievements – did not always please the public or NASA alike. When a disease of the inner ear, Meniere's Syndrome, prevented him from taking active part in the subsequent Gemini Programme, he was put in charge of the other pilots. Typically, 'Uncle Al' battled against the affliction for six years, beat it, and went into space again with Apollo.

The success of Shepard's Mercury mission led to the Project assuming an even more important role. As thousands flocked to see Freedom 7 on display, President Kennedy pledged the nation to a manned Moon landing before the end of the decade. Congress duly increased the budget, and

the second flight was under way.

On 21 July Air Force Major Virgil 'Gus' Grissom took off aboard Liberty Bell 7 (Mercury 4). Like the previous mission, this was a sub-orbital flight with zero-g again lasting for 6min. Everything went according to plan until splashdown, when the capsule, after hitting the water at 28 ft/sec, began rolling badly on the waves. Soon after, explosive bolts holding the escape hatch blew, and the craft began to sink. Grissom, who had abandoned ship, watched as frantic attempts to recover the capsule failed; Liberty Bell 7 was lost 300 miles from the Cape. Investigations into the premature hatch blowing failed to solve the mystery, although subsequent touchdown procedures were revised.

Grissom also received the DSM, but under something of a cloud – there were serious doubts as to the way he had handled the disastrous splashdown. However, he continued to be 'where the action was', and made his first orbital flight as Commander of Gemini 3 in March 1965. Sadly, Gus was killed during the Apollo 204 launch-pad fire two years later.

Russia's second manned mission, 17 orbits by Gherman Titov on 6 August 1961, renewed the pressure on NASA. Yuri Gagarin was less than kind with his comments about the so-called 'Space Race' saying, 'We've sent a few dogs up and down – just like Alan Shepard.' It was to be another six months before America finally put a man into orbit.

Lieutenant Colonel John Glenn, a 40-year-old son of an Ohio plumber, had been involved in the pre-NASA Mercury conceptual studies. His 'boy next door' appeal, enhanced by TV appearances, had made this former marine test pilot the most popular of the seven astronauts. Glenn had been bitterly disappointed at being left out of the first two missions, but his chance came on 20 February 1962.

After two launch postponements, for bad weather and a fuel leak on the new – admittedly not fully tested – Atlas 109 D rocket, Friendship 7 (Mercury 6) left Cape Canaveral at 0947hr Florida time. Seven elliptical orbits were planned, but a warning light indicated that the heatshield and landing cushion were no longer in position. Glenn was ordered to return after three orbits, leaving the normally jettisoned retro-pack strapped across the heat shield to act as an extra buffer. Fortunately, the warning was a false alarm, and America's first 'proper' astronaut landed safely, just 40 miles short of the target.

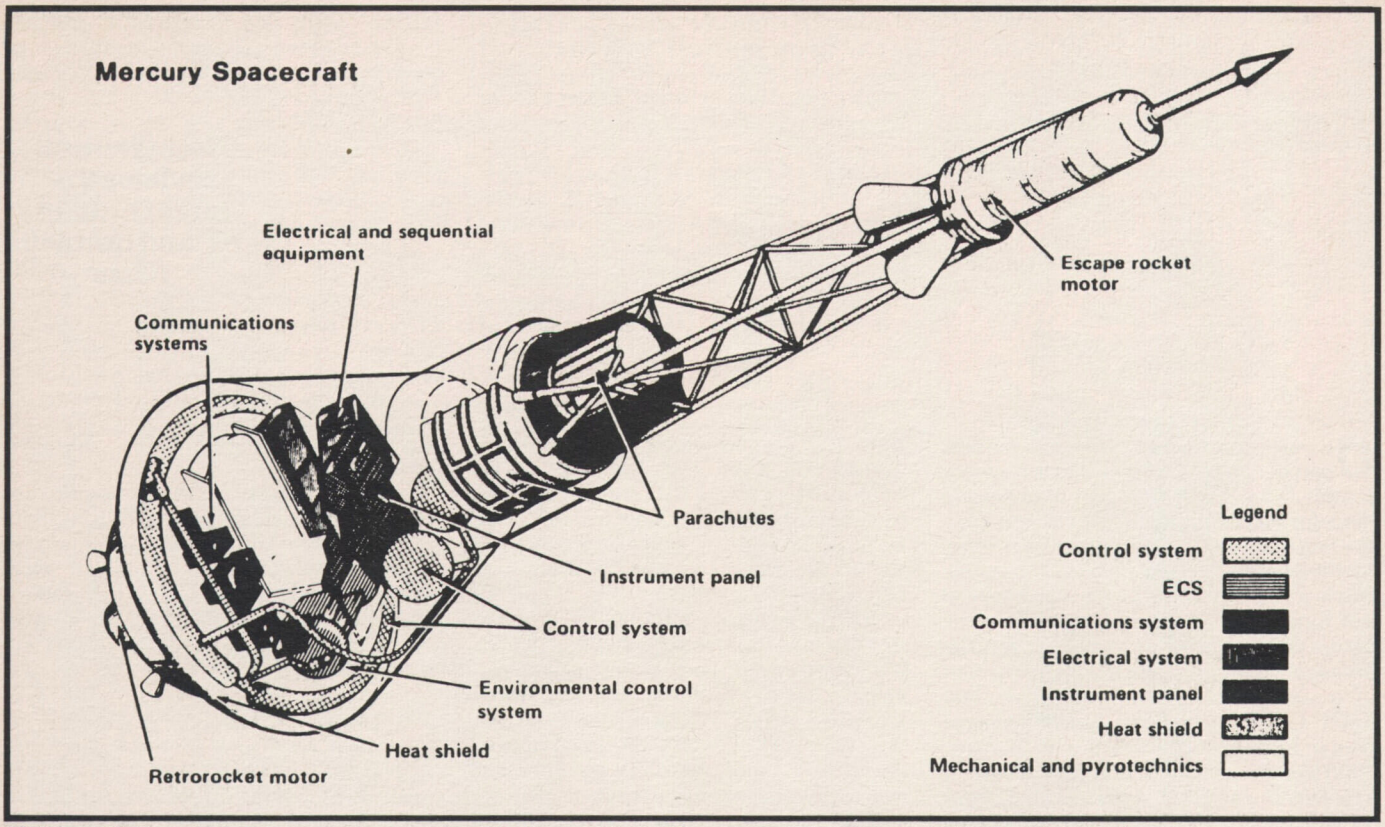
John Glenn's 4hr 46min adventure brought him the kind of adulation normally reserved for film stars. While Grissom and Schirra accused him of being a 'goody-goody', and for spending too much time on the public appearance circuit, this somewhat shy and unassuming man became NASA's premier Space Ambassador, pioneering the celebrated Astronaut-Cosmonaut meeting during the 1960s. Ironically, Glenn never went into space again, quitting NASA to run for Senate in 1964. An accident at home literally knocked him out of the race, but he was to be successful in later years.

The seven Mercury astronauts were elevated to movie star status and NASA had to intervene on more than one occasion when businessmen and the media went too far. **Pix courtesy Warner Bros.**

Glenn's back-up astronaut had been Scott Carpenter. This Colorado-born seaman had trained with Glenn for Friendship 7 right up to the launch, even accompanying him to the launch pad. He was the natural choice for the next flight on 24 May. Scott often admitted that he enjoyed the view, but little else about astronauting! His carefree attitude, which included smuggling a sandwich aboard his capsule, Aurora 7 (Mercury 7), often upset officials.

During his three orbits, Carpenter took

The 1½-ton Mercury capsule was built by McDonnell. The astronauts campaigned vigorously for more control during their flights and eventually their demands were met.



McDonnell's Mercury capsule was tiny compared to later projects. The astronaut lay on a specially moulded couch.

19 pictures of the Sun and many more of Earth, relaying the view from his window with great excitement. He delayed cockpit drill to send back more passionate descriptions, finally punching the re-entry button 3sec late. After a nerve-racking descent, Aurora 7 overshot the target by 250 miles. Several rather cruel reports said the anxious Carpenter was 'crying like a baby' on the way down; yet he got his medal, before quitting NASA to join the Navy's Sealab project.

Russia's answer to Carpenter's flight was another space 'first', two manned, but unpowered, craft performing a brief orbital rendezvous. US engineers reacted by urging NASA to add more power to the Mercury craft, enabling it to manoeuvre in space; but research revealed that the extra equipment would add another 4cwt to the capsule's weight, making orbital attainment difficult. It was decided to carry on with the original plans, with more tasks being added to the astronaut's flight duties.

Walter Schirra completed six orbits in Sigma 7 (Mercury 8) on 3 October 1962. He performed radiation tests, control checks, operated a new periscope and took numerous pictures of Earth. Sigma 7 landed in the sea at 1628hr after a fairly routine mission. It was afterwards that the unexpected occurred. Although Schirra told doctors he was feeling 'A-OK' during the post flight medical, his blood pressure and heart rate gave widely different readings between sitting and standing. It was assumed that prolonged weightlessness had caused his circulation to become sluggish, and blood was pooling in his legs and feet. Although the condition – orthostatic hypotension – receded overnight, and the bulging veins in Schirra's lower limbs returned to normal, future astronauts took exercise during zero-g to sustain their circulatory systems.

By the beginning of 1963, astronauts had become big business. A Houston builder attempted to promote a new housing estate by offering the seven spacemen a $35,000 house each, completely free of charge. When the Mercury Men admitted that they intended to rent out the dwellings, and eventually sell them, NASA ordered them to refuse the offer.

Even so, America had become increasingly optimistic about the Space Programme. Soviet manned activity had been quiet for some time. US insurance companies, satisfied that space flight was not a suicidal venture, began issuing life policies to astronauts. Nine new pilots were selected for the upcoming Gemini Project, although one of the original Mercury crew, Deke Slayton, was grounded after his heart 'murmoured' during training. He later became head of Flight Crew Operations Directorate on Apollo.

So Air Force Major Leroy Gordon Cooper became the last American to go into space alone, when Faith 7 (Mercury 9) left the Cape at 0840hr on 15 May 1963. During the 34hr 16min flight he made 22 orbits, four more than originally hoped for, with each one lasting 88min 45sec.

Cooper's main task was to test man's ability to observe his space environment, but – in contrast to Scott Carpenter – he complained during the flight that all he did was take pictures. However, he did eject a 6in diameter sphere into space, and 'eyeballed' its twin flashing lights as it followed him around the Earth. Cooper reported seeing roads, villages, rivers, and smoke coming from house chimneys. This last claim was disbelieved until later missions showed that visual resolution was better at 100 miles up than at 10 miles. (Cooper's maximum altitude was 130 miles).

As dawn broke on 17 May, 28 ships, 171 aircraft and 18,000 servicemen awaited Faith 7's splashdown near Midway Island in the Pacific. It was a perfect re-entry, but the orbital part of the flight had presented some minor problems. The cabin's water supply had ceased; the Auto-Land control malfunctioned, causing the 'Return To Earth' light to come on after 19 orbits; and Cooper, who had to contend with spacesuit problems, lost half a stone in weight.

Yet the final Mercury astronaut took it all in his stride. By adapting and modifying tests, Gordon Cooper brought back vital information; most of all, he had proven conclusively man's value aboard a spacecraft, not only to observe and carry out tasks, but to adapt to unforeseen situations. All along, the astronauts had demanded more control over the spacecraft and their destiny, and now these demands were seen to be valid – not just the result of some 'egotistical justification' on their part.

Project Mercury had evolved from being merely an automatic capsule carrying a passenger, to a man-controlled space vehicle. Its achievements had paved the way for the next two decades of American manned space flight. ●

VIEWSCREEN VIEWSCREEN VIEWSCREEN

Neil Gaimon reviews the latest crop of SF and fantasy films

Do you want to know what the hardest part of film reviewing is? Or, to be more precise, what the hardest part of reviewing films for this magazine is? I'll tell you – it's the fact that I'll often see a film two or three months before it's released, but, because this is a bi-monthly magazine which can be put together anything up to four months before you see it, my reviews won't actually arrive on your local newstand until the film in question is incredibly old news. 'Aw heck!' I can picture some **Space Voyager** reader somewhere muttering to himself, 'That Viewscreen guy is only just reviewing *The Search For 2001 Alien's Gore Spatter Vengeance Strikes Back,* while I've already seen it 30 times! Sheesh!'

For example, take *The Return To Oz* (Disney, U) I first saw it in May, it got released in July, and you're reading this in September. By which time everybody's already told you what a great film it is, and you've already seen it half a dozen times, right? I hope so. However, if you haven't heard anything, or it hasn't reached your neck of the woods yet... Dorothy was created by Frank L Baum, an American author, around the turn of the century, and immortalised by Judy Garland in *The Wizard Of Oz* about 30 years later. Now the part is taken by American newcomer Fairuza Balk. But anyone expecting a reprise of *Somewhere Over The Rainbow,* or for hordes of Munchkins to bob about burbling 'Heigh Ho, the Witch is Dead' will be in for a surprise. No songs, and only minor bit-parts for The Tin Woodman, The Cowardly Lion, and the Scarecrow.

It's six months after Dorothy returned from Oz, and her Uncle Henry and Aunt Em are worried: she isn't sleeping, and she keeps talking about Oz, this impossible world she visited. In desperation they take her to a 19th century psychiatrist, who resolves to experiment with her brain and electricity – but before he is able to carry out his evil plans, Dorothy and her chicken are swept away to Oz in a flood.

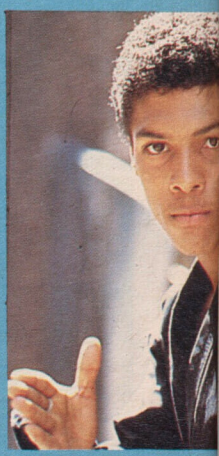
They arrive to find it a different place from what Dorothy remembers. The yellow brick road is in ruins; all the people of the Emerald City have been turned to stone; strange, long-limbed creatures with wheels where their hands and feet should be patrol the streets; the wicked witch Mombi, with her glass cases of stolen heads, is ruler of the City; and Dorothy's old friend the Scarecrow has been stolen away by the evil Nome King. Luckily Dorothy has some new friends – a robot named Tik Tok, a contraption named Jack Pumpkinhead, a moosehead attached to some sofas called The Gump, and of course Billina, Dorothy's chicken.

A funny, visionary, scary, wonderfully realised film, that holds its own against both the original film and against Baum's original books. Go and see it, and enjoy. Nicol Williamson is outstanding as the evil Doctor and the wicked Nome King, as is Jean Marsh in the dual role of Nurse Wilson and Mombi the witch.

Night of the Comet

In *Night of the Comet* (Entertainment, 15) Regina and her jailbait sister Samantha are more than a little upset to find that a fabulous comet has turned everyone in the world to piles of red sand. Not totally everyone, actually: there are a few people who have turned into zombies; some evil department store backroom boys; a bundle of underground scientists; and a sweet guy named Hector. Many teenage girls would find this situation hard to cope with, but our intrepid heroines are made of sterner stuff – and thank goodness their Daddy, the ex-marine, taught them both everything there is to know about unarmed combat and automatic weaponry...

A witty, imaginative, satisfying film (believe it or not), made on the kind of budget that wouldn't furnish one room in Oz, or pay



for Roger Moore to raise an eyebrow. However, I enjoyed it far more than most of the big-budget stuff doing the rounds at the moment. Catherine Mary Stewart and Kelli Maroney play the two heroines with aplomb, Mary Woronov is a great scientist, and the whole thing is done with verve and a great sense of fun. If you miss it, you'll have missed something good.

SHE

SHE (Avatar, 18) on the other hand can be missed with a clear conscience. An awful film. A terrible film. Funny, in a perverse sort of way, but I always find myself suspicious of films I laught *at*, not with. It's a sort of a *Mad Max meets Barbarella* rip-off, with as much resemblance to H Rider Haggard's *SHE* as Linda Lovelace has to Margaret Thatcher – ie they are both female, but the resemblance ends there.

Tom and Dick are hunting for Hari (who is Tom's sister, and has been stolen by the Norks) and after captivity in She's city they escape, taking Herself with them, and set off across trackless wastes of great peril. Vampire hippies, mutants with limbs that drop off, psychic messiahs, mad doctors, and an ubiquitous bridge-guarding human bomb are but a few of the awful perils that they face. Nowhere near as bad as those faced by the audience, which include wooden acting, a cardboard script, and a Motorhead soundtrack! Do not bother with this film unless you are either desperate, drunk, or very, very silly.

Trancers

'Last January I finally singed Martin Whistler, out on one of the Rim Planets. Since then I've been hunting down the last of his murdering cult. We call them Trancers – slaves to Whistler's psychic power. Not really alive, not dead enough. It's July now, and I'm tired. Real Tired.' The voice-over belongs to Jack Deth, a cop in Angel City a few hundred years from now, star of *Trancers* (Entertainment, 15).

Above: **Night of the Comet.** ***Below:*** **A View To Kill, The Last Dragon,** ***and*** **Night of the Comet.**

He's the kind of guy who makes Judge Dredd look like a *Guardian* reader, or Dirty Harry look like Radar from *M★A★S★H.* Rough. Tough. A cop. So when he discovers that Martin Whistler isn't dead, there's only one thing for him to do: go back in time to December 1985, where Whistler, in the body of a Los Angeles Cop, is bumping off the ancestors of the Angel City ruling council. Deth is sent 'down the line' to the body of an ancestor of his, and after slicking the hair back and donning a trenchcoat, he

gets on Whistler's trail, aided by the girl that his ancestor, Phil, had taken home that night.

Made by Charles Band, the man responsible for *Ghoulies* it's a fun, witty, comic-book of a movie, which I enjoyed immensely. It's also just out on video, so you have no excuse for missing it.

Cat's Eye

Stephen King's *Cat's Eye* (EMI, 15) is a collection of three stories, two of which will be familiar to anybody who's read the *Night Shift* anthology. *Quitters Inc* is the story of a man who wants to give up smoking – but the organisation that he enlists to assist him use methods that are, to say the least, unorthodox. (The sequence based around The Police's *Every Breath You Take* song is brilliant.)

The other two stories aren't as good: there's *The Ledge*, about a bet made between two men; and the title story, in which the cat that links the three stories is united with a small girl (Drew Barrymore) who needs the cat to fight off the troll that lives in her wall, and comes in each night to steal her breath. . .

An enjoyable film, and Stephen King fans will enjoy spotting the references to his earlier books and films hidden in the stories. One of the least pretentious adaptations of King for the screen, and thus one of the most successful.

***Roger Moore and Christopher Walken in* A View To A Kill.**

A View To A Kill

A View To a Kill (UIP) is very much the mixture as before, as Bond films go. Roger Moore looks older, but the plot is as formal, the set-pieces as expensive, the wenches as buxom, and the villiany as villianous as any of the last half-dozen films. The only things I really thought stood out were Christopher Walken's magnificent performance as millionaire industrialist Maz Zorin (plotting to destroy Silicone Valley and corner the world microchip market) and Grace Jones as May Day – a woman with legs that go up to her neck, and a wonderful, wonderful laugh. All very familiar, though, and it will no doubt make more than I could in a million or so years of writing this column. Unfair, isn't it?

The Last Dragon

Berry Gordy's *The Last Dragon* (Warner) is a Kung-fu, Tamla Motown, dance movie comedy with fantasy overtones, and you probably think I'm making that up. A young, black disciple is told by his *sensei* that he must seek a new master, and hunts for him through Chinatown; Arcadian, the video arcade king, wants to make his girlfriend a rock star, by fair means or (preferably) foul; Laura (Vanity) is the video DJ who keeps getting kidnapped by Arcadian's thugs and rescued by Bruce Leroy (the black disciple); other characters include the hero's wise-ass kid brother, Sho Nuff 'The Shogun of Harlem' – about 7ft high, *mean*, and bucking for a fight with Leroy; jive-talking oriental soul-brothers who run a fortune-cookie factory, and some psychopathic killers. And a man-eating fish – I nearly forgot about that.

Corny, but good fun for anyone who likes that kind of thing – and judging by audience response at the preview, most people did.

***Scene from the fantasy dance movie,* The Last Dragon.**

Legend

Legend (20th Century Fox) is a visually wonderful film, and the initial rumours about it sounded very exciting. Who could resist a film made for adults, that actually does something intelligent with the characters of legend and myth? The idea that today's special effects technology should be let loose on creating demons, faerie, unicorns, goblins and the like was one that stirred my blood and made my little pointy ears stick up.

And then I had to go and spoil it by seeing the film. Thirty seconds in, I was bored, and it was all downhill from there. It may well be expensive, and beautiful, and a stupendous recreation of archetypal myth (etc), but it

has none of the sense of wonder that the myths are meant to carry – and do carry, in the original. The Lord of Darkness (played by Tim Curry, in a stupid devil costume with a phallic chin) wants to bring eternal night and winter to the world, and despatches his goblins (the only worthwhile characters in the film) to de-horn and kill a couple of unicorns. However, he is frustrated in this plan by a lovely princess, a handsome forest youth, a Puckalike named Gump, Tinkerbellalike named Oona, and sundry pixies and such.

It's a visual treat – set design, special effects, and make-up are all impressive – but the direction is wooden, the actors seem miscast, and the whole is one long yawn. A miss.

Back To The Future

Despite the time troubles in getting this column to you, sometimes we get it right. Rarely more appropriately than with *Back To The Future* (UIP, PG) which is all about travelling in time. Back 30 years, to be precise, which is where Marty (Michael J Fox) is sent in a converted DeLorean car. The car was converted into a time machine by Doc Emmett Brown (Christopher Lloyd) using some plutonium snatched from Lybian terrorists who wanted the Doc to make them an atomic bomb. In escaping from the terrorists, Marty gets propelled back to 1955, the year that teenagers first started to take over. And back in 1955 he finds that his future dad is a wimp, his mother 'has the hots' for him, and he's going to have to get the two of them back together if he's ever going to exist at all! And getting back to the future isn't easy either, even with a 30-years-younger mad scientist to help.

***Time traveller Michael J Fox finds himself face to face with his future mother in* Back to the Future.**

Chris Lloyd, as Dr Brown, steals the film with his inventions and inspired guesses about the future, but the whole script is witty and smart, rarely going for the obvious targets; watch Marty invent skateboarding and rock and roll, and wonder what *your* parents were like 30 years ago. Funny, inventive and you have to see it to believe it.

Cocoon

At the end of *Cocoon* (20th Century Fox) I walked out of the cinema into Hyde Park. Low, grey thunder clouds were rolling: there was no rain, but bolts of lightening were splitting the sky, and for one bizarre moment I thought . . . No, I'm not telling you what I thought. It would give too much away about *Cocoon*, and I don't want to do that. It's too good a film to spoil.

Basically, it's a film about friendship, and about making choices and taking chances. Among the characters called upon to make their choices and take their chances are some old people from a Florida retirement home; a smooth-talking but shallow boat captain named Jack; a quartet of aliens led by Walter ('The last mistake I made was 10,000 years ago, when I picked Atlantis as our base. Everybody else said I should choose the North Pole'); an eight-year old boy; and, presumably, some dolphins, but they don't get to talk much.

The trouble starts when three old men trespass into a swimming pool, in an abandoned house, that seems to possess the power of the legendary fountain of youth as soon as the house is taken over by the aliens. They are using it to store a number of mysterious cocoons that they brought up from the sea bed on Jack's boat . . .

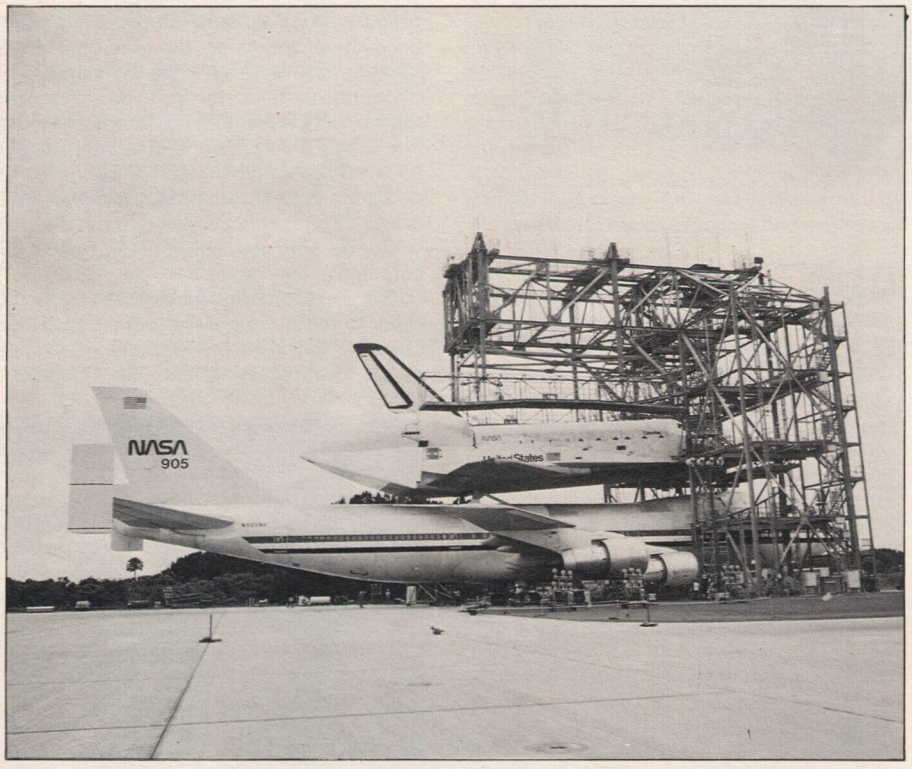
Made mostly on location in Florida, filmed as naturalistically as possible (excluding George Lucas' Industrial Light and Magic's contribution), *Cocoon* succeeds because it seems to be about very real people. It's a lovely, life-affirming film, directed with care by Ron Howard (*Splash!*). Very highly recommended, as one of the first SF films in a long time to have both a large budget, a strong script and good actors. *Last of the Summer Wine meets ET!* It would be nice to think that this could be the start of a new trend, but somehow I don't think it will be.

So, to recap: go and see *Return to Oz, Night of the Comet, Back to the Future* and *Cocoon*, get *Trancers* out on video, and picket *Legend* as a film that degrades goblins. ●

Michael J Fox as Marty, left, and right with Chris Lloyd as the inventor.

INDUSTRIAL ACTION

Duncan Lunan reports from the Space Development and Space Manufacturing Conferences in the USA and looks forward to the time when man will live and work in space



One of the major results of my visit to the USA last year was an invitation to speak at this year's Space Development Conference in Washington, sponsored by the L5 Society and the National Space Institute. I had already been invited to give a paper at the Space Manufacturing Conference, sponsored by the American Institute of Aeronautics and Astronautics (AIAA) and the Space Studies Institute (SSI), in Princeton; fortunately the two events were only two weeks apart.

The four societies have common aims in terms of pushing for ongoing development of space technology, and protecting what there is from the cuts and cancellations which can so easily happen under the US political system. Beyond that the National Space Institute has an overall educational stance; the L5 Society exists specifically to promote the concept of free-flying, self-supporting colonies in space; and the Space Studies Institute, founded by Professor Gerard O'Neill, is a privately funded body sponsoring the technical research needed to make such a thing a reality.

A fascinating breakdown by Trudy Bell of the American Space Interest Group, reveals that the total membership of the space advocacy 'movement' in the USA has doubled in the last four years, with 50 societies controlling a total budget of $50 million! While they all operate campaigns to influence congressmen and senators with letters, phone calls and visits, the number primarily engaged in political activity has grown only slowly. Membership of the professional body, the AIAA, has doubled in step with the general rise; the same has happened in educational activities, due partly to the formation of the President's 'Young Astronauts Council'; but the biggest rise has been in numbers engaged in practical research, outside the government programme, financed, for example, by the SSI.

This programme includes studies of space solar power satellites; industrial processing of Moonrock, where studies are moving into a phase where experiments on actual lunar samples are to be permitted; and electromagnetic launchers ('mass drivers'). There exists a short prototype segment of a mass driver with the full diameter needed for a programme of lunar mining. It routinely achieves accelerations of a thousand gravities and can be driven to 1500 g reducing the many kilometres of launch track (once thought needed to reach lunar escape velocity) to a mere 200m. In other words the development problems of the lunar launch mass driver have already been solved at just the third experimental model stage, and nowhere near the limits of the system have yet been reached. The research team could barely conceal their satisfaction, as they noted that 10 years ago critics were claiming that the system could never be driven past 20 g.

The Next Logical Step?

Parallels with the spaceflight societies in the UK are very instructive. Political advocacy of space development has been in the hands of the British Interplanetary Society – which seeks to be the voice of astronautical professionals within the aerospace industry – and on the amateur level over the last four to five years (virtually the same timescale as in Trudy Bell's study) by the Free Space and Space Settlers' Society. I don't have access to the membership

figures for either of those bodies, but the numbers engaged in direct political activity have shown no obvious dramatic growth.

ASTRA, the Association in Scotland to Research into Astronautics, had a steady growth in membership over the same period with a doubling in the last 12 months – apparently due not to so much to the ongoing educational programme as to the new involvement in practical research. One major factor has been the Wave-rider Aerodynamic Study Programme, a matter which I covered at the Space Development Conference, and in **Space Voyager** and *Space World* (USA).

One of the major topics at both conferences was President Reagan's commitment of the USA to building a space station in the early 1990s. Among the reports on its design and potential uses, including a particularly positive one on meteorological uses by Stanley Schneider of the National Oceanic & Atmospheric Administration, the overall picture was of controversy and major unresolved problems. To the complaint from scientists that their purposes could be better served, more cheaply, by unmanned satellites, the answer is that the main purpose of the station is to develop commercial applications in space – taking up the opportunities in vaccine processing, metallurgy, ultra-pure crystals, etc – revealed by experiments on Skylab and on the Space Shuttle. But despite the slogan 'The Next Logical Step', it's one which American industry seems curiously reluctant to take.

Fear that the programme might be cancelled isn't the main factor (anyone working with the US government has to live with that); but as a number of speakers pointed out, the only companies who can profitably involve themselves in the space station at this stage are the ones who built it. Potential users aren't yet in the picture because, while there's venture capital available for space projects, they are considered to be high-risk projects and carry interest rates around 33%. In effect that means that commercial space projects have to show a profit within five years, and only communications satellites can guarantee to do that.

Withdraw

Even there the cost of Space Shuttle operations ($10,000 per pound launched, plus the cost of ground services) is a major bone of contention, especially because of the erratic launch schedule. It's been reported that McDonnell Douglas and Martin Marietta, makers of the Thor-Delta and Titan boosters respectively, tried to bid for communications satellite launches against the Shuttle and were warned to withdraw or be dropped from the space station project.

Vast profits

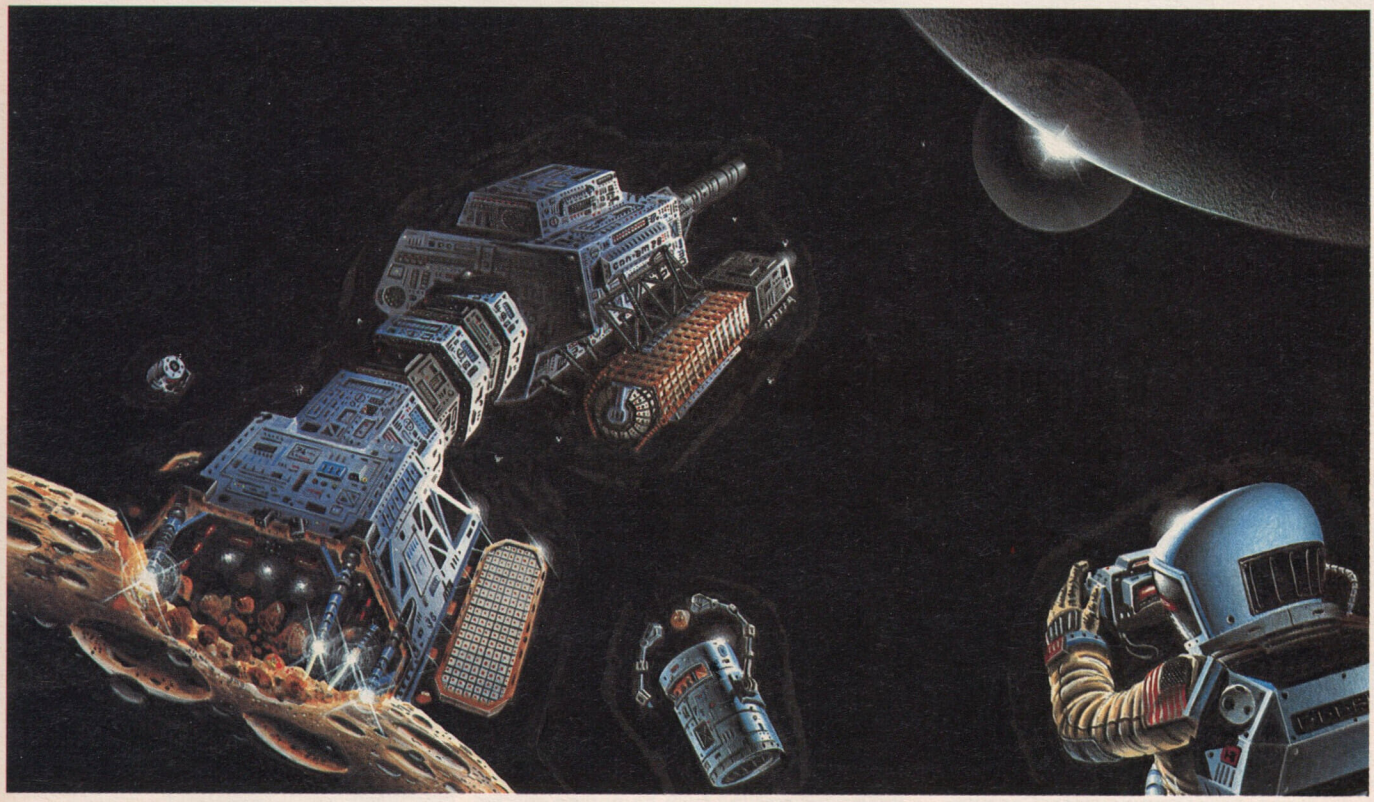
Wolfgang Demisch, of the First Boston Corporation, pointed out that the cost of space projects tended to be 10 times that of other types of Research & Development investment. Even the aerospace companies are cautious; referring to recent disclosures of vast profits on military supply contracts, he remarked, 'We're not selling as many $5000 claw-hammers as we used to, the margins are going down.' The McDonnell-Douglas investment in electrophoresis research, for vaccine processing, he described as, 'Mr Mac's personal baby.' And then added, 'But there's not too many guys like him around – most managers are caretakers, not entrepreneurs.'

Mining the asteroids

The full width of the gap between the hopes of the space pioneers and the perceptions of the situation by industry, was revealed by another speaker who complained, 'NASA said to us, "We want to develop the commercial prospects of space." "Great," we replied, "you're going back to expendable boosters?" "No," said NASA, "we mean we want you to buy modules on the space station." '

Meanwhile argument was raging elsewhere over the practicalities of mining the asteroids. Dr Brian O'Leary, well known as an advocate of such programmes, surprised last year's 'Case for Mars II' conference in Colorado by shifting his allegiance to the moons of Mars as targets: they're almost certainly captured asteroids, they've already been surveyed, and in the energy needed to get there, travel time, and frequency of launch windows they represent a good compromise among the difficulties of mining the nearer asteroids.

Professor Randal Barnes of the Colorado School of Mines, speaking in Washington, saw all such programmes as doomed because of the interest charges which would pile up while the investors waited for the first payloads to arrive. Other speakers saw an answer in short missions to asteroids passing close to the Earth, con-



Developing the commercial prospects of space. Is it 'The Next Logical Step' or pie in the sky? **Drawing by Tom Campbell.**

centrating on the extraction of high-value elements like platinum in the few weeks before the return launch window.

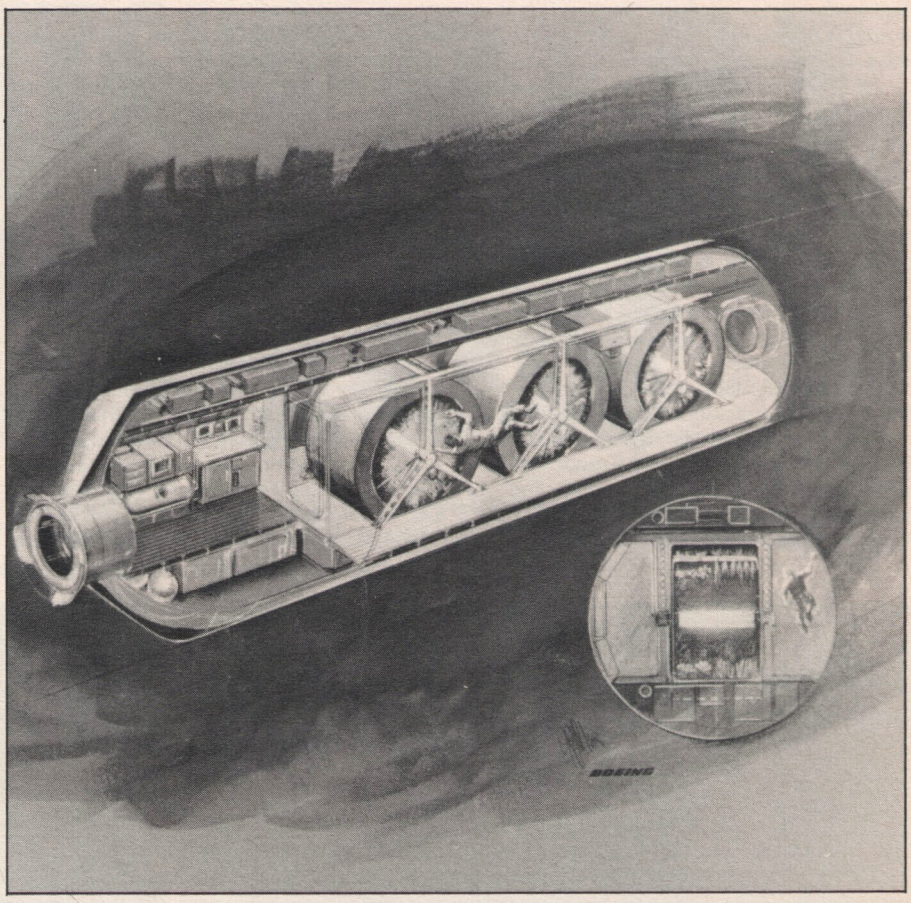
A much more effective answer, in the longer term, would be not to mount such missions from Earth. The problem is, how do we get through the present bottleneck into such a large-scale programme of space industrialisation? My own 'Project Starseed' paper (a popular version of which was in *Analog* in February) sets forth one possible answer, which involves building structures out of Space Shuttle external fuel tanks, taken into orbit instead of being deliberately re-entered and destroyed. Such proposals are very much out of favour, now that the 'reference concept' for the space station has been decided upon and doesn't use external tanks; an External Tank Underground has been formed to keep them alive, by analogy with the Mars Underground which called the first 'Case for Mars' conference. The next round of the external tank contest will be well worth watching!

Communities in space

At the Space Development Conference, Brian O'Leary chaired a fascinating session on 'Communities in Space'. What would living in space really be like? For all the physiological and psychological studies of 'improving human productivity' on the space station, Brian reported that NASA engineers would still accuse him of wanting a playboy pad in space when he suggested that the occasional potted palm might be nice! Antarctic bases might be the closest terrestrial parallels, but discussion among the experts revealed that no professional studies existed of how their social patterns had come into being. In any case, the parallels were not close enough to be of much value, and studies of prisons, nuclear submarines and military bases were still less relevant. There was great interest therefore in the Argo Venture, a British proposal to run a 12-month social simulation of the start-up of a Mars colony. (Note what *that* will do to the UK growth curve of people engaged in practical research at the amateur level!)

One of the activities of the Argo Venture simulation group would be to draw up a constitution. This aspect particularly interested Joanne Gaorynowicz, a Constitutional lawyer who has made a detailed study of relationships between the US Constitution and the science of the day. In space the situation will be very different because the laws will define the environment in ways unknown here: on earth, if you pass a law repealing the Law of Gravity, things will still fall down – in space that doesn't have to be the case. (As I pointed out in 'Man and the Planets', the value of artificial gravity in space habitats will be a major political issue once there are people acclimatised to the values on the Moon and Mars.)

To encompass such variables, future laws may have to incorporate elements of Relativity and the Uncertainty Principle, as the US Constitution incorporated a Newtonian, mechanistic view of Nature. In her own paper at Princeton, Joanne modelled the US Constitution as an octagonal structure; if so, I suggested, the corresponding one for space settlements might be a Fibonacci Spiral – which, according to Professor Eric Laithwaite at last year's IBM Heathrow Conference, may be the true shape of space itself.



Concept of pressurised Controlled Ecological Life Support System shows how rotating drums would simulate gravity to grow plants in space as a food source for astronauts. Lower circular drawing, cutaway of drum. **Boeing Aerospace.**

At the Princeton conference there was a discussion session on space colony charters, chaired by James Muncy of the White House Office of Science & Technology Policy and starting from an outline charter devised by Professor O'Neill. One participant expressed the likely evolution in four drawings. The first showed a capsule in orbit, with the astronaut declaring, 'Look at me, I'm a space colony.' 'Roger,' says Mission Control. Voice off: 'Bring him down.'

Stage 2 was the commercial station, owned by 'Starbuck Inc'. 'I want to be independent.' 'You're fired.'

Stage 3 was the mobile habitat, captioned simply, 'Dear John . . .' Or as the artist Kelly Freas had put it at the Washington conference, 'The first time a corporation gives an independent ship captain an order he doesn't like, the reply will probably be, "Catch me if you can." '

And Stage 4? A space habitat in a new planetary system, with a group of people looking down at an uninhabited world. 'Let's write a planet charter.' 'Cute idea . . .' ●

Space Advocacy Group Addresses

UK: Argo Venture: Dr Tony Flower, Administrator, 18 Victoria Park Square, Bethnal Green, London E2 9PF.

ASTRA (Association in Scotland to Research into Astronautics): Bill Ramsay, Secretary, 19 Eastfield Avenue, Cambuslang, Glasgow, Scotland.

British Interplanetary Society: LJ Carter, Executive Secretary, 27/29 South Lambeth Road, London SW8 1SZ.

Free Space and Space Settlers' Society: 162 Kingsheath Ave, Rutherglen, Glasgow G73 2DB.

USA: American Institute of Aeronatucs & Astronautics: 1633 Broadway, New York, NY 10019.

L5 Society: 1060 East Elm, Tucson, Arizona 85719.

National Space Institute: 600 Maryland Avenue, SW, West Wing Suite 203, Washington, DC 20024.

Space Studies Institute: 285 Rosedale Road, PO Box 82, Princeton, New Jersey 08540.

EXTERMINATE!

Chris Richmond constructs a very authentic Dalek model

From their first appearance on December 28th 1963, Daleks have ranked with Robbie the Robot as the most famous and popular science-fiction creation of the century. Across Britain, thousands of children hid behind their sofas as the technological dustbins rolled across the TV screens in glorious monochrome shrieking 'Exterminate!'

Now, after over 20 years terrorising the galaxy, the Daleks have been captured in a 1/5th scale model kit by **Sevans Models** of Trowbridge in Wiltshire. The company is a family concern, headed by Stuart Evans, who designed the kit which many say is more realistic than the 'real' thing.

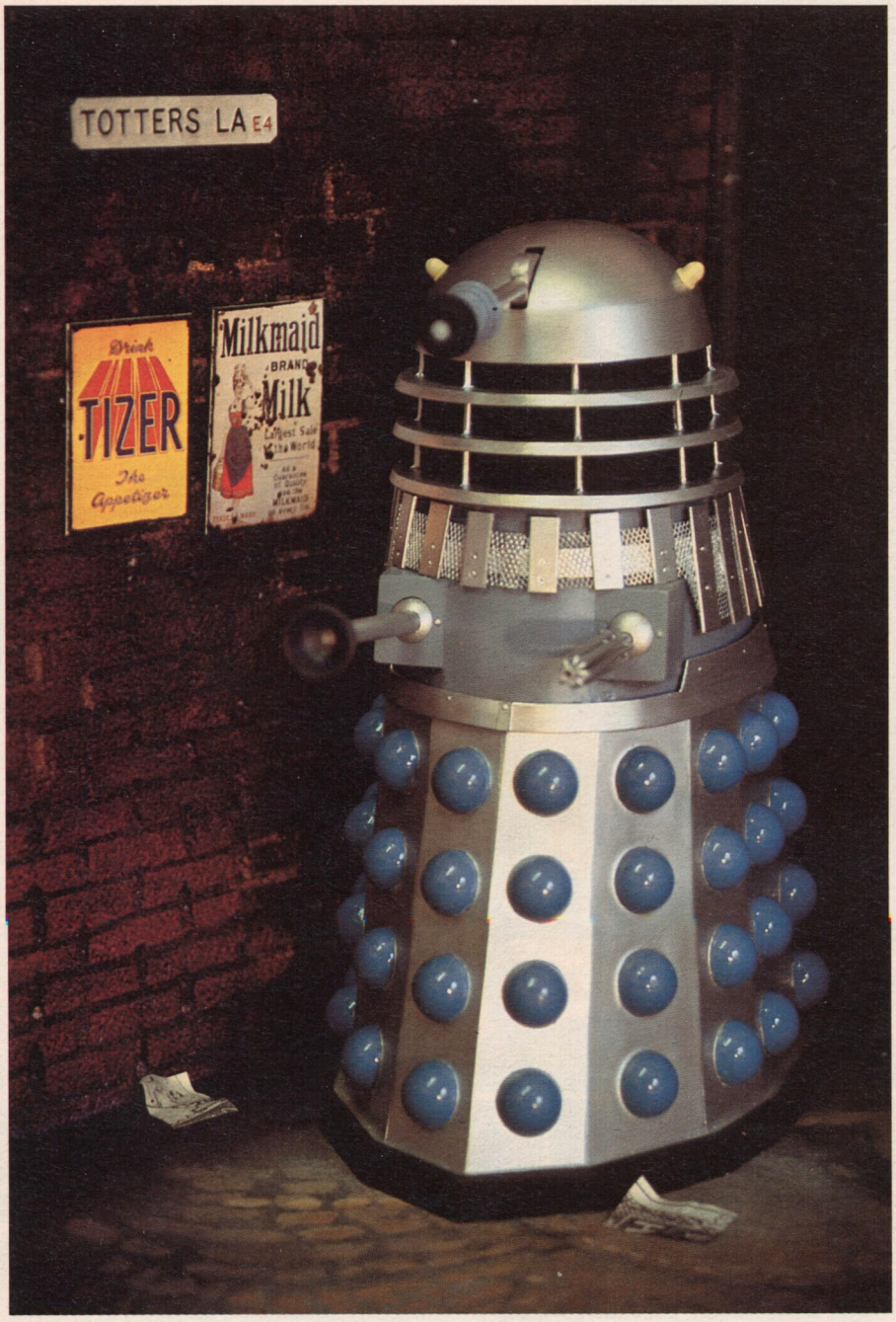
The kit is largely constructed using a vacuum-formed system, stretching sheets of plastic over moulds to create the parts, the exceptions being the gun, sink-plunger and eye-stalk which are injection-moulded. Vac-forming is an inexpensive way of producing a kit, particularly if only short runs are required, which can sometimes show up in the finished product. Thankfully, some care has been taken with the Dalek and the various components are all well formed from good plastic and come half prepared, so only a relatively small amount of whittling and sanding is required to prepare them for construction.

The instruction sheet, which features an extensive history of the Daleks (did you know that the word 'Dalek' is now included in the Oxford English Dictionary?) and a fully comprehensive modelling and painting guide, is clearly laid out, with generous instructions to help the less experienced modeller. It is strongly advised that you read the sheet carefully before beginning the model, as vac-form kits do require a fair amount of do-it-yourself work which is very important if the model is to go together properly.

Construction

Begin, then, by carefully checking all the components and removing any excess plastic with a knife and medium grade wet 'n' dry paper. This is very tiresome work but persevere and your efforts shall be rewarded. When all the major components have been attended to, construction begins with the base, working upwards. Parts aren't actually numbered but checking them against the illustrations will soon sort out what's what.

The first problem arises with the Dalek's 'skirt'. The panels, with the many hemispheres (56 in all) moulded on, must be

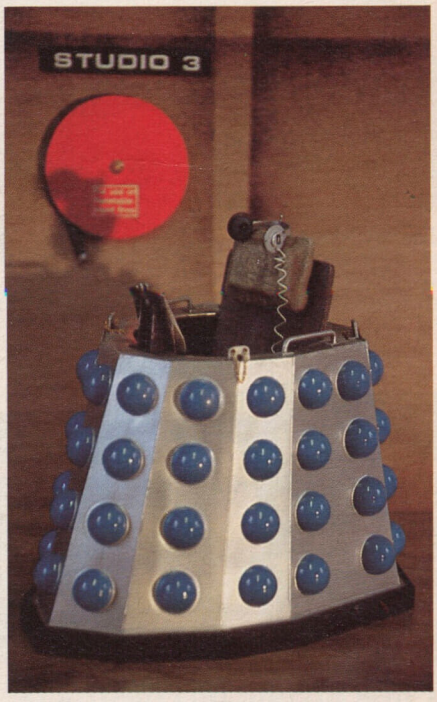


separated and numbered to avoid confusion. The parts must be lightly sanded and built into the characteristic skirt shape. I anticipated some trouble here and sure enough the fit of parts is not perfect so be prepared for some dextrous juggling, trimming and sanding to get the best possible fit before applying any glue. Gaps and uneven joints are still likely to occur, and the instructions suggest three solutions; thin masking tape – an ideal answer for the less experienced modeller; plastic soup – made by dissolving old model sprue in liquid model cement or a strong solvent such as **Windsor and Newton 'Winsol',** available at art suppliers; and model filler. I chose the latter of these, using **Humbrol** Fine Model Filler. This comes in a tube and is a fine paste which, if used adroitly, is suitable for minor filling jobs.

When a fairly smooth finish has been achieved, leave the filler overnight and continue with other sections of the kit. When thoroughly dry, the filler may be sanded and re-applied where necessary. The easiest way to check this substance is to apply a coat of paint which will show up any faults and guide you when sanding. When you are satisfied with the result, apply two coats of matt white as the filler is grey and will show through the final paint job as a dark smear.

The next stage is the shoulder section which houses the Dalek's 'arms'. This is constructed from three major components and has options for fixed or moveable antennae. The three main sections feature 'internal detail', thoughtfully provided specifically for you to remove and use on another model. Holes have to be cut if moveable antennae are desired, and blanking plates are included to ensure a neat finish. The inter-stellar Dyno-Rod sink-plunger is easy, but lightly sand the outer sheath in preparation for painting.

The gun has to be fitted with eight rods running up its length. These are provided in the form of two long rods which have to be cut and bent to shape. In the review sample one of the rods was grey and the other black. I mention this because the black, thinner rod is made of a more brittle plastic which will need gentle heating (heavy breathing) and gentle handling while bending to prevent it from snapping; each long rod will make five smaller ones so you're only allowed two mistakes. Put the rods in place before gluing and run liquid cement into the joint, not tube cement. Don't fit the antennae immediately, there is a lot of work



still to be done on this stage which will be easier without the guns.

Add the front blanking plate, mask off the locations around the base where glue is to be applied, and this section can be painted. For this I used US Tank Grey in the Humbrol Mini-Spray range. Two or three thin coats should be applied and, when thoroughly dry, shoulder collars and mesh can now be added. The collars, and vertical covering slats, were painted gloss black; the mesh provided must be painted matt white to help stiffen it, followed by whatever colour you finally choose (matt black here).

When all other parts have been added, the antennae may be fitted. They are held in place with a simple plastic blanking plate which seems rather amateurish. It is vital that this be wedged firmly in place and glued all round to prevent the arms, particu-

larly the sink plunger from drooping. I added some insulating tape to the front of the plate to increase the friction.

The dome

The dome is the focal point of the whole kit. Two are supplied in case you make a hash of the first one. Holes are cut and sanded for the eye-stalk and 'indicators', and the dome can be painted in a satin black. Indicators on the review sample were painted inside with Tamiya's transparent orange paint, and turned continually while drying to prevent slick or pool marks. When in place, these were blanked off with black insulating tape to prevent anyone from seeing inside the dome.

The eye-stalk, as with the antennae, should be sanded lightly to remove seam lines, and be painted silver-grey. The stalk discs will need their holes widening slightly to fit snugly over the stalk, and may be glued in place with liquid cement; these should be painted gloss black as should the eye-globe. The kit provides a variety of paper irises which, although poorly printed, may be used as a guide for careful over-painting with gloss colours. The eye-stalk may be held in place on an axle within the dome and is moveable. I sanded the axle thinner and covered it with insulating tape for a more durable swivel point, the ends of the axle were then cemented inside the dome with plastic card buttresses and tube glue for a secure weld.

The Dalek's neck, like the shoulders, is formed from three component discs which may be painted or covered with mesh for more authenticity. I took the easy way out, painting the background matt black, and the slats gloss black; paint the undersides as well, as these are visible on the finished model.

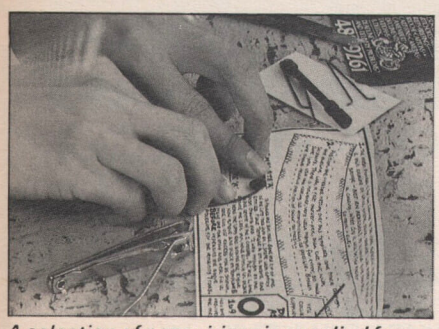
When painting the model, I was surprised to read in the painting guide that there had only ever been one red Dalek, and that was only by chance – the Dalek in question was a half-painted prop to be used later, and the red colour was just the primer for the top-coat! Nevertheless, as I've got to look at the thing in future, and no-one can really tell you what colour to paint something that doesn't exist, I persevered, using Humbrol mini-spray Bright Red 19, though a satin finish may be preferred by some. Before spraying, the skirt bumper was masked with tape, and the 56 hemispheres with Maskol masking fluid. This is a pink liquid latex solution available from most model shops, but if you can't afford it, a rubber solution glue such as Copydex should work in roughly the same way.

Having applied two coats of red, I noticed the filler was still visible, as were the numbers I had written on the inside of the skirt panels for identification. To counter this, I cut a large hole in the underside of the model and sprayed the inside with the remainder of the US Tank Grey. Another two coats of red were obtained before the can began to spatter but the paint was now thick enough to hide most of the sins underneath. When dry, and remember gloss paint will pick up smudges and fingerprints for some time, the masking was removed and the excess red paint on the revealed parts was scraped off where possible. The bumper was painted matt black and the hemispheres with a satin black mixed from two parts matt to one part gloss.

Finally, the three main sections are glued together, building into an impressive authentic replica of the real thing, standing over a foot tall. There is plenty of scope for variation and conversion, including 'exterminated' versions and there is room for the addition of a motor unit or flashing lights such as those sold by **Polytechnic**, who advertise elsewhere within **Space Voyager.**

Availability, it seems, has been a problem in the past, with the production runs being greatly over-subscribed by modellers everywhere. However, more are being made, and Stuart Evans has hinted to me that there may be variations on the market in due course so keep looking . . . or else you'll be exterminated! ●

Careful trimming of the skirt components will improve fitting.



A selection of paper irises is supplied for the eye stalk.

The three main sections are glued together after painting.

The skirt bumper and hemispheres are masked with tape and fluid.

A large hole cut in the base allows the inside to be sprayed.

Additional details from Stuart Evans

Extra modelling tips: *On the very early 1960s Dalek variants we push shake-proof washers over the ray gun before applying the struts, and use the best silver paint on the market – 'Coverplus' aerosols from Woolworths – yes, it sounds cheapo but all the professionals use it!*

On the later Daleks, ie, Peter Davidson onwards, the Dalek neck was seen to be raised from the shoulders. To achieve this simply insert the spare dome (two domes are supplied with every kit) between shoulder and neck – it'll take some trimming but looks just right. Also, the later rayguns look much more sleek, to achieve this simply glue the gun struts directly onto the raygun flat without bending the edges.

Future plans: *The models are easily motorised and with a few modifications can reproduce all the movements of the full size machines. Regards new kits, in order, we are doing: Davros, feature film Dalek – with big base (this model will also include flashing dome lights) and claw arm, and Hovabout – the Dalek's mini ships as seen in TV21, all in 1/5th scale.*

There will then be a Tardis and console kit, a Cyberman and a Mechanoid though the scales of these have yet to be decided and ALL will be at least *another six months away. The Daleks will remain at £14.95p for as long as possible, which, considering the amount of workmanship involved, is extremely reasonable and should fans be interested, we do supply limited numbers of fully made up and painted kits, prices upon request.*

Fans are quite welcome to write to me on any question concerning the product, but must *send an SAE for the reply. The address to send for your kit is: SEVANS MODELS, PO BOX 34, TROWBRIDGE, WILTSHIRE BA14 8XY. Our prices include postage.* ●

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or

How to get into print in five easy lessons

The Space Voyager office in the bowels of A.S.P. regularly receives articles sent in by readers for publication. If you want to send something in for consideration, you can increase your chances of success by following these simple rules:

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2. You should send all the illustrations necessary (the more the merrier) with the article. Drawings need not be works of art – the Voyager drawing office will probably redraw them anyway. Photographic images can be either prints or transparencies, colour or black and white.
3. You must be the copyright owner of all the material submitted or have obtained whatever clearances are necessary for publication.
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5. Articles that have not been specifically commissioned for publication in Space Voyager by the editor must be accompanied by a stamped, self-addressed envelope.

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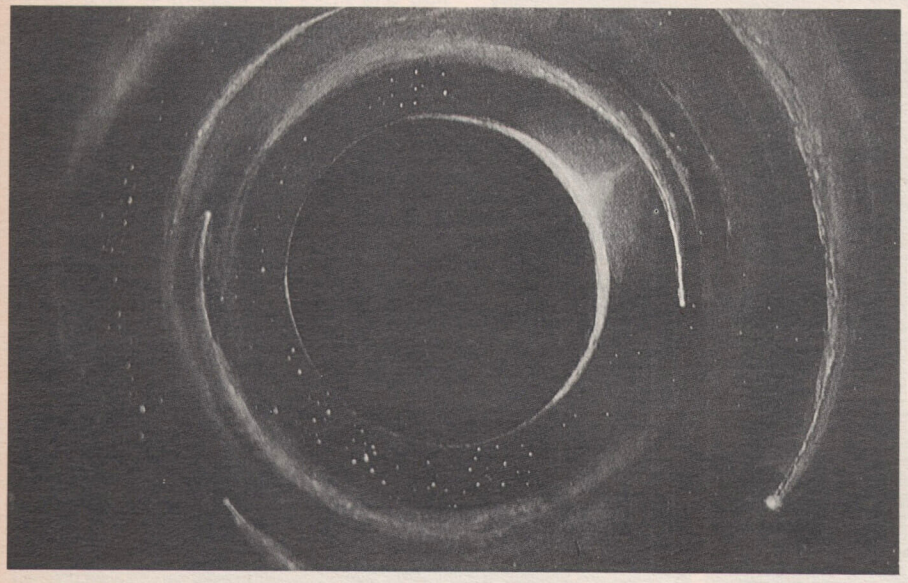
NEXT STOP... URANUS

After travelling nearly 3 billion km, Voyager II has almost reached Uranus. Aldo Rabaiotti looks forward to what it might reveal



At last, after a depressingly long period of relative inactivity, a number of major unmanned space missions are coming to final, patiently-awaited, fruition. Undoubtedly, 1986 will be the most event-filled year this decade, with a small flotilla of 'ships' heading out to (variously) explore Halley's Comet and Jupiter. In addition, 1986 will see the launch of the remote Space Telescope which is sensitive enough to resolve the very limits of our solar system and far beyond.

Overlooked in favour of more 'contemporary' projects and by the revival of manned spaceflight, speeding Voyager 2 has remained quietly in limbo awaiting its encounter with the barely visible blue/green giant Uranus on 2 January 1986. Six years ago Voyager sent back a multitude of incredibly detailed photographs of the gaseous giant Saturn and its radically different moons.

Shortly, at about 3 billion kilometres, Voyager will make a similar flypast of the even more mysterious Uranus. Even though it is third largest of the planets (51,800km) it has only been astronomically recorded in the last 200 years. In fact, Uranus was the first major planetary body to be discovered following the invention of the telescope. Using a 6in 'home-built' telescope, the astronomer royal, William Herschel, in the process of carrying out a complete stellar survey down to the 8th magnitude (ie stars about 10 times fainter than those visible to the naked eye), came across, as he wrote on 3 March 1871, 'a curious either nebulous star or perhaps a comet'.

Indeed, even today it is believed that 'comet-like' bodies played an important part in the accretion of Uranus from the cooling solar nebula. Tail-less and obviously moving in a manner befitting a planet, Herschel's 'find' was initially named the Georgian Planet (*Georgian Sidus*) in honour of the then reigning monarch – King George III. The Frence sensibly called it 'Herschel's Planet' but eventually it was unofficially renamed Uranus (Father of Saturn, who in turn was Father of Jupiter) from Roman mythology, by the German astronomer Johann Bode.

Since Uranus has an almost circular orbit, it is fairly easy to locate. At the time of Voyager 2's closest approach the planet will have its polar face turned towards Earth and near to the constellation Ophiuchus (the Snake Bearer) which is located a small distance North of the bright star Antares. In addition, Venus will pass a mere 1° 5′ North of Uranus and is perhaps the best marker to locating the planet which will be visible as a faint disk (in telescopes 4in and larger). Under clear night skies it displays a perceptible, through fuzzy, blue-green facia arising from red-light absorption in its atmosphere. Astronomers have reported seeing faint markings or blemishes on its disk; in particular, translucent greyish encircling the entire planet on occasion and at other times only parts.

Even so, these features are far less conspicuous than the latitudinal cloud banding to be seen on Jupiter, though they are comparable, in appearance at least, to those visible on Venus and Titan. Elusive faint and sporadic spots, noticeable darkening of the disk towards the limbs or edges, have also been recorded but these could be simply the result of shadowing effects created within its dynamic atmosphere or slowly moving 'whirls' of dense methane (and probably other as yet undetected heavy gases) within the cloud layers. Visually Uranus tells us little, keeping its bland polar region pointed directly towards us.

Observing Uranus is made particularly difficult because its disk subtends an angle less than 4′ of arc in the heavens making it minute not only in size but also in its microscopic movements. Worse, its uniform atmospheric conditions seldom permit features smaller than about 0.5″ of arc to be resolved to any great degree. Even with the most outstandingly high contrast levels obtainable, no clearly discernible surface markings are to be seen. Some 3000 visual observations taken in 1916 (the data holding good today as it was when it was first recorded) did show a 15% variation in brightness within a rotational period of almost 11hr. Even so, these large variations were not obtained from similar observations carried-out the following year and as a result the responsibility could not be placed directly on spotting and/or limb darkening or the effects of red-light absorption.

Using (comparatively) the stellar magnitude scale, Uranus over the past century had an average brightness 'nearest-to-Earth' (ie mean opposition) of about +5.8, with the faintest 'naked-eye' stars registering on our retinae at about +6.5. As a general rule, the observed brightness can change by half to a whole magnitude from this mean depending on the respective positions of Earth and Uranus, Uranus and the Sun, and their corresponding distances

which will give a greater or lesser level of reflectivity. Recently, very precise photo-electric measurements have established a mean opposition figure of +5.5, though at present, Uranus's brightness stands at +5.7.

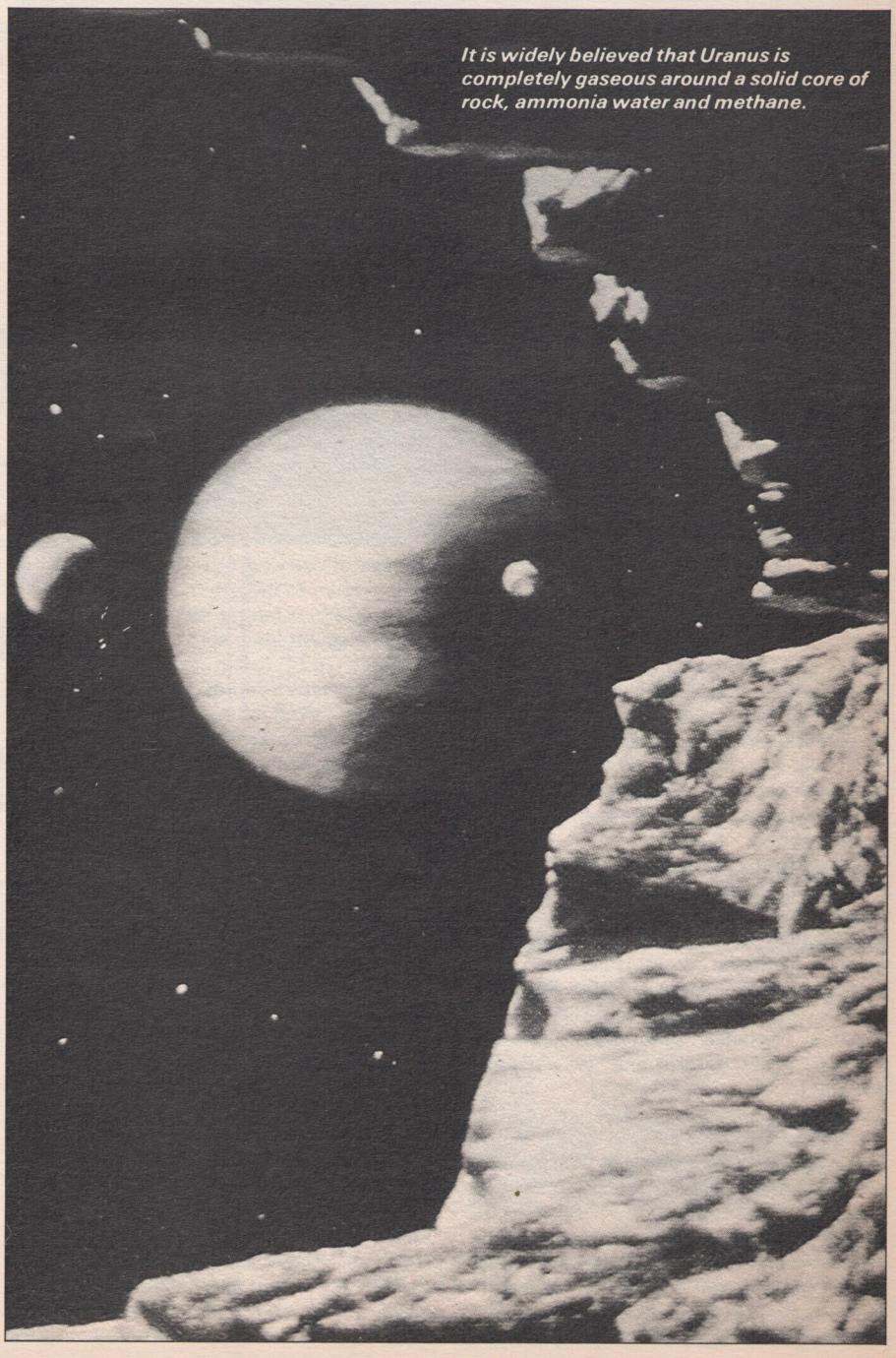
From research carried out in 1932, laboratory and high-resolution spectroscopic studies have confirmed that there MAY be a blanket of methane some 35km thick. Nevertheless, the atmosphere must logically consist of chiefly hydrogen and helium, but because both these gases are almost spectroscopically invisible at low temperatures, the methane predominates, possibly hiding a more unusual interior cloud layer. Weak hydrogen levels have been detected which, when scaled-up, would give Uranus a light-gas layer approximately 480km in depth. Speculatively, the entire atmospheric cocoon may, like oil and water, have separated out into liquid, partially liquid and purely gaseous layers, but only Voyager can confirm the accuracy of this and the other numerous theories that have been proposed.

The widely accepted belief is that the planet is completely gaseous hanging around a solid core of rock, ammonia, water and methane. Various infrared and radio-radiation techniques have determined that the temperature in the visible outer atmosphere ranges from −150°C to −200°C (−250°F to −350°F). Bearing in mind Uranus's gigantic size and large mass, its average density is only 1.15 times that of water (though greatly in excess of Saturn's 0.71) and far less than Earth's 5.55. Quite obviously, this reading points directly towards Uranus being a planet composed of much lighter materials. If the situation were any different, its greater mass would lead to compression and consequently, much greater internal pressures and densities than are to be found on the terrestrial planets. The two lightest elements, hydrogen and helium, must be accompanied by appreciable amounts of the next common and heavy elements, especially carbon, nitrogen and even oxygen. Voyager's instruments will, hopefully, pinpoint Uranus's major elements and attempt to see the 'truth' beneath its outer methane mask.

Uranus's rapid rotation on its axis leads to an appreciable reduction in the effective force of gravity at the equator, hence to a substantial amount of oblateness (or equitorial bulging); 0.06 as compared to Earth's 0.003. Direct micrometer measurements give an equitorial diameter a startling 6-8% in excess of the polar diameter, a factor which is all to often ignored by artists who attempt to accurately depict an unphotographical world. This flattening should be the most immediately apparent feature of Uranus when the time comes for Voyager to use its cameras.

Undoubtedly its most remarkable feature is the highly exaggerated tilt of 98 degrees (Earth's is only 23.5 degrees) and with a retrograde rotation taking approximately 10.75-11.5hr. More exactly, the planet has an inclination of 178 degrees, more than a right-angle, making it unique out of all the members of the solar system. There is no doubt that some exceptional, catastrophic or otherwise, event must have occurred eons ago to create this situation. Indeed, when we consider Neptune's 'normal' tilt of 29 degrees, the curiously retrograde motion of its planet-sized moon Triton and the dithering eccentricity of Pluto's orbit, we can theorise that these three planets were once part of a much larger body or, possibly, were late in forming from a slowly accreting nebula while the matter forming the inner planets had already congealed. If Uranus's tilt and retrograde motion was caused by a collision with a comet or asteroid, then it's possible that Neptune is today what Uranus was in the past. Perhaps there is evidence of such a collision on the far-side.

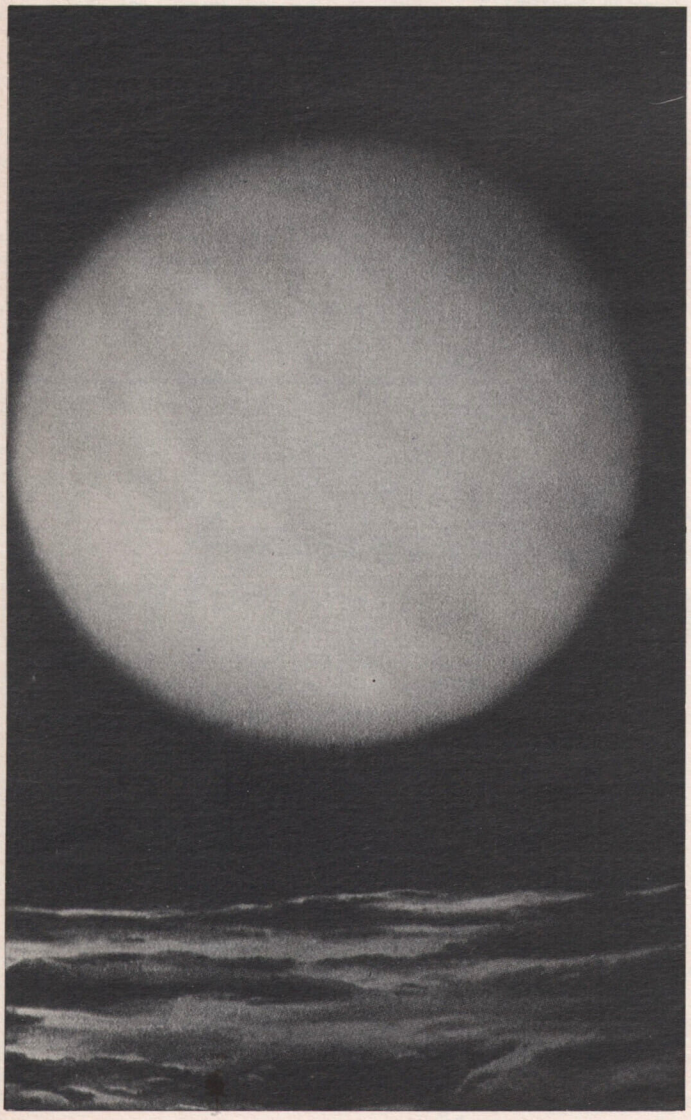
Visible only as faint luminous dots on photographic plates, Uranus's satellite system is compact and closely co-planar with the planet's equator. Thus its rotation and the revolution of the satellites are essentially perpendicular to the orbital revolution of Uranus about the Sun. Even less is known of the moons. In 1787 Herschel discovered Oberon and Titania; by 1871 Ariel and Umbriel had been located but the innermost of the five, Miranda, with less than 10″ of arc was first photographed as recently as 1948 from the McDonald Observatory in Texas. Voyager's flight path will take it to within 16,000km of this small moon (estimated to be 300km in diameter), closer than the revealing Voyager 1 flyby of the 'pizza-planet' Io in March 1979. There are



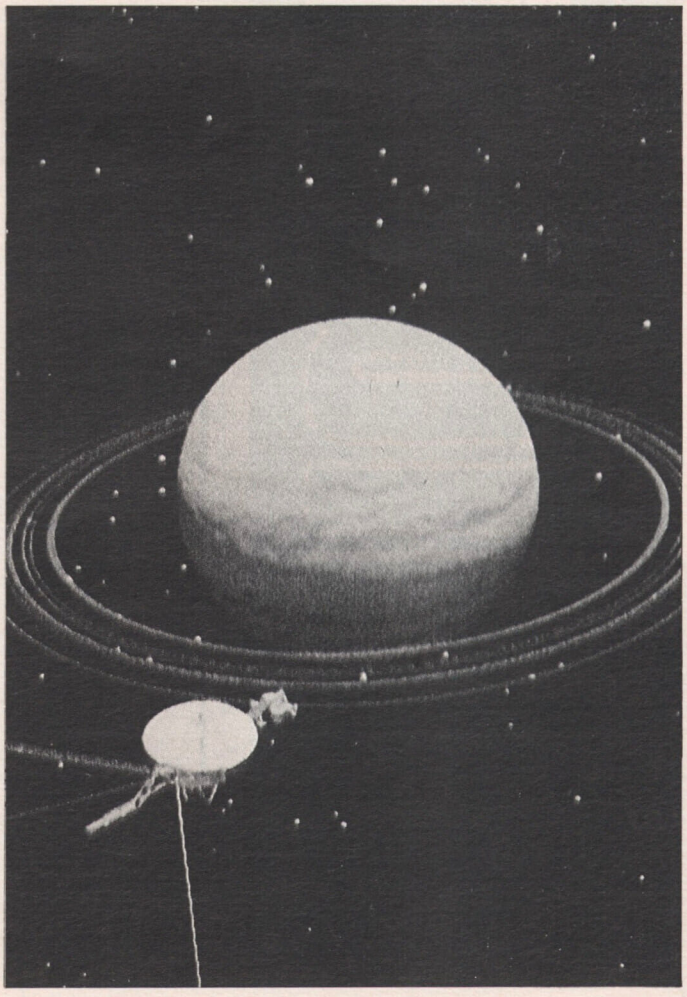
It is widely believed that Uranus is completely gaseous around a solid core of rock, ammonia water and methane.

probably no other satellites brighter than 20th magnitude within a radius of 0.5 degrees from the planet. Even so, the Voyagers transmitted numerous totally unexpected images of the moons of Jupiter and Saturn and in the light of this we can only wait with baited breath to see what really has never been seen before.

Since a gravity-assisted flight to Pluto would require Voyager 2 to fly virtually through the centre of Neptune, the small nomad must wait for a future spacecraft. We can look forward to Voyager arriving at Neptune on 24 August 1989 where it will scoot low over its North Pole just 7500km above the cloud tops and a 44,000 'close encounter' with very strange Triton. Voyager's cleverly pre-planned trajectory will allow it to fly through the Earth and Sun occulation zones of both Neptune and Triton – unquestionably, an incredible feat of celestial navigation at a distance of 4.5 billion km. Following the Neptune rendezvous, Voyager 2, like its brother, will leave the solar system at 16km a second on its way to the bright star Sirius, a journey which will take 385,000 years, guarantee its place in history, and truly earn the title VOYAGER. ●



Voyager 2 is due to encounter Uranus on 2 January 1986. Will we discover that the giant blue/green planet is the product of cometary accretion? There may be evidence of such a collision on the far side. Voyager 2 should provide some answers.



NIGHT SKY

Duncan Lunan gazes skyward in his regular column and tells you what to look out for during the months of September and October

SEPTEMBER

The planet *Mercury* has an interesting month in the morning sky, passing just south of Mars on 4-5 September. *Sky & Telescope* gives the minimum separation as 0.8 arc minute, occurring at 2100hr UT (GMT) on 4 September – when it will alas be invisible from the UK and United States, and in daylight elsewhere. When the two planets rise on the morning of the 5th, they will be drawing apart but within half a degree of each other still. On the morning of the 6th, Mercury will be 1 degree north of the star Regulus, in Leo.

Venus also passes Regulus, 0°.4 to the north, on 21 September, and remains a bright object in the morning sky. The Moon is near it on the 12th.

Mars is faint in the morning sky, fainter than Mercury when they pass on the 4th-5th, and fainter than Regulus, from which it will be 0°.7 north on the 9th. On the 13th it's near the waning crescent Moon.

Jupiter is a bright 'evening star' throughout the month, near the Moon on the 23rd, and setting around midnight (GMT) by the end of September.

Saturn is still visible in the early evenings but is now off our map, setting at 2100hr GMT, the time for which the maps are drawn by Jim Barker.

Uranus is also about to leave the map, though still observable in September for about two hours after sunset.

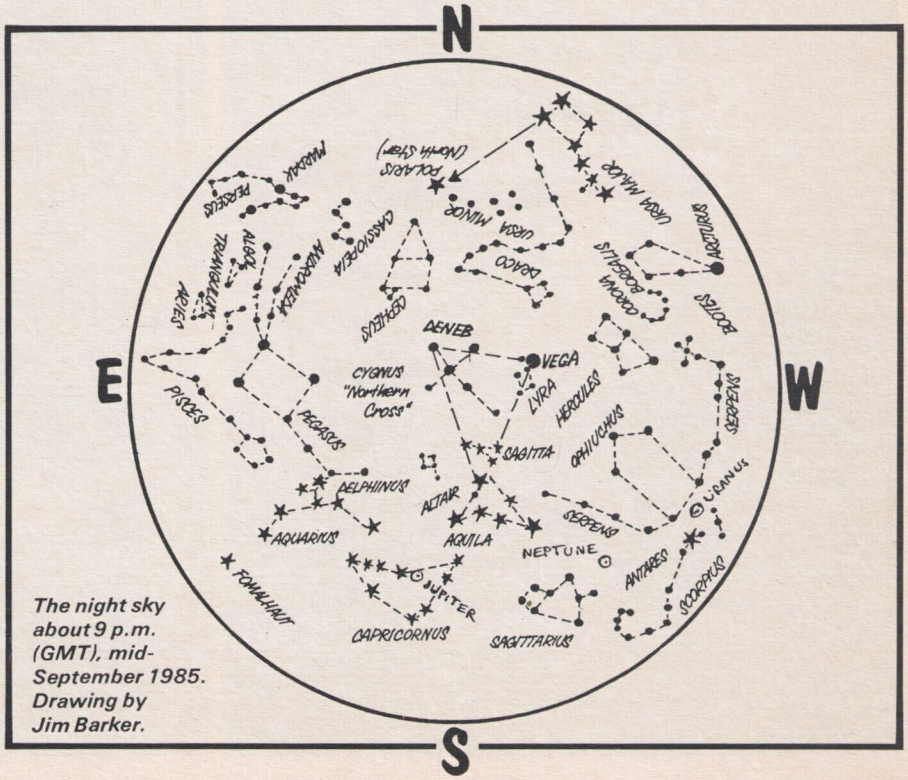
Neptune sets at about 2200hr (GMT), and as always can only be found with the help of a detailed star chart and binoculars or a telescope.

Despite its unsocial hours, the conjunction between Mars and Mercury is a gift to ASTRA, the Association in Scotland to Research into Astronautics, whose Ayrshire Branch is holding an exhibition on the exploration of Mars to coincide with the Viking Festival which commemorates the Battle of Largs. The 'Viking' connection is obvious and the planned programme includes speakers from the Viking Re-enactment Society as well as from the Jet Propulsion Laboratory, Pasadena (which managed the Viking spacecraft) and the Argo Venture (which is studying the future colonisation of Mars). Exhibits include photographs, original paintings and models, and enquiries should be addressed to Mr John Bonsor, 20 Aitken Street, Largs, Ayrshire. Dates are 31 August-21 Sept.

OCTOBER

Mercury is in the evening sky for the last three weeks of October, but only visible to observers in the southern hemisphere.

Venus is drawing gradually nearer the Sun in the morning sky, rising about 0400hr (GMT). On 5 October at 0100hr UT (GMT) Venus will be just 0°.1 north of Mars, but



The night sky about 9 p.m. (GMT), mid-September 1985. Drawing by Jim Barker.

the closest approach is before they rise in the UK, still further (obviously) before rising in the United States. For observers in Britain and the USA, the two planets will be within half a degree on the mornings of the 4th *and* 5th. The Moon appears near Venus on the 12th.

Mars is rising nearer 0300hr as the month continues, but it remains relatively faint at second magnitude – about as bright as the stars of the Plough. It too appears near the Moon on the 12th, and is at its furthest from the Sun (aphelion) in reality on 17 October.

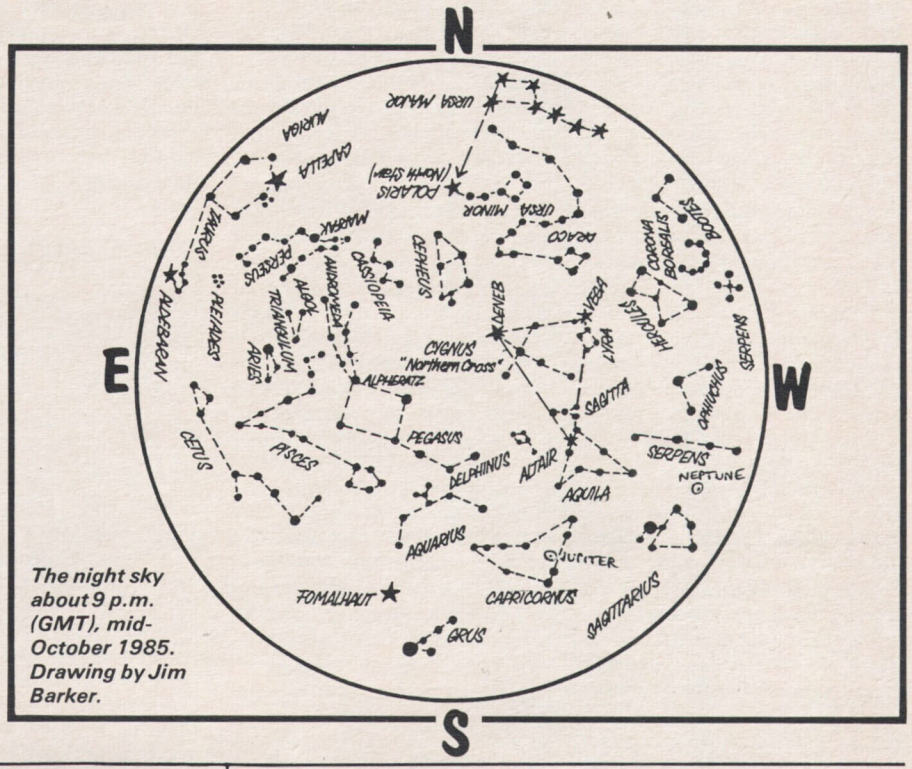
Jupiter is now low in the south-west in the evenings, setting before midnight, north of the Moon on the 21st.

Saturn is near the crescent Moon on the 16th, 4 degrees to the north of it, and otherwise will be hard to locate in the twilight except for observers near the equator. They will be able to see the conjunction on 29 October, when Saturn is 4 degrees north of Mercury.

For northern observers *Uranus* and *Neptune* present the same problems, still in the sky in the early evening but lost in the twilight.

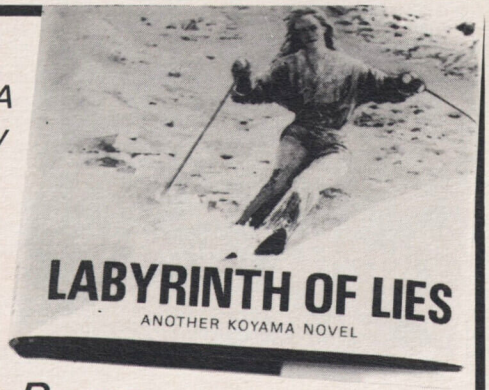
The Orionid meteors of 16-30 October, peaking between the 20th and 24th, are of great importance this year because the swarm is generated by Halley's Comet. The comet itself is still beyond the range of most amateur instruments, but the records of the meteor shower will be of major scientific importance – and there's always the chance of a spectacular display, as in AD 288 and 1651.

The Moon, which happily will not spoil Orionoid observations, will be totally eclipsed on 28 October from 1720hr to 1804hr and already partially eclipsed when it rises over Britain. The eclipse can be seen everywhere from the Pacific round to eastern Greenland, but only from the extreme west of Alaska in the USA. ●



The night sky about 9 p.m. (GMT), mid-October 1985. Drawing by Jim Barker.

A Gripplingly taut science fiction story by



Adrian Berry

This story is solidly grounded in science. You will enjoy reading about Ephraim Koyama the dictator – subtle and devious; Koyama's young assistant, the cynical Karen Larsen; the enigmatic Grand Admiral Schwerin; the sinister Bowgrath leader Archcount Starfield Brockman and above all the 'intelligent' computerised skis that carry Tiki Shaftoe across the mountains – and nearly murder her. All are elements that combine to make a tale as swift in pace as it is ominous in its atmosphere.

Philip Purser of the **Sunday Telegraph** writes, *it moves at a pelt, has nice humour.* **Tom Hutchinson** of **The Times** says *Saga stuff which is one gulp reading.*

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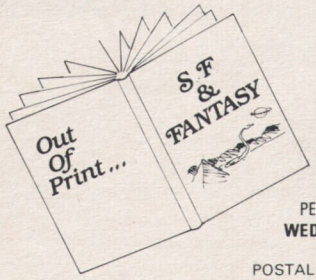

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READOUT

Machines That Think **edited by Isaac Asimov. Published by Penguin at £4.95. Soft covers.**
A collection of 29 short stories from some of the great SF writers based on our fear of 'pseudo-humans'. Asimov introduces the book with his own theories on what he calls the 'Frankenstein complex', a totally illogical fear of machines that many humans seem to possess.

The 'pseudo-human' tag might lead you to think that the book is totally concerned with robotics but there's a good deal of reference to the humble computer in there as well.

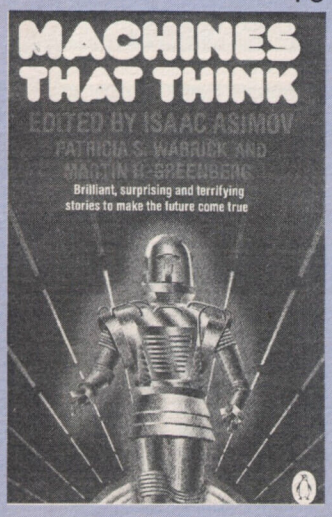
On whichever subject, these are classic tales from the likes of John Wyndham, Lester Del Ray, Harlan Ellison, Harry Harrison, Arthur C Clarke, Philip K Dick, Poul Anderson and so on.

Especially fascinating are the older stories, the earliest being written by Ambrose Bierce in 1894. Read Murray Lenster's *A Logic Named Joe* for example, which accurately predicts the home computer boom years before miniaturisation was even thought of.

Associate editors of the compilation are Patricia Warwick, a computer expert who provides some fascinating introductory notes to each story, and Martin Greenberg, the leading SF anthologist, so you can be sure that the stories included here are the best in their field.

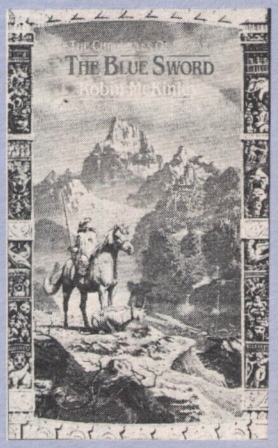
Altogether it's a fascinating insight into some of the great minds of the century. At the end you'll ask yourself, is our fear of machines so illogical after all?

PC



The Blue Sword **by Robin McKinley. Published by Futura Publications at £2.50 Soft covers.**
This is the first in a series of fantasies set in a mystical frontier land known as Damar, which separates a far flung region of the Homelanders' empire from the dark kingdoms of the North. Comparisons with Tolkein's Middle Earth are inevitable though the first few chapters of this book are more reminiscent of *A Passage to India* and all that colonial stuff as they tell the tale of how Harry (Angharad) Crewe comes to be the guest of Sir Charles and Lady Amelia in a fine house near the border.

It's all balls. . .dinner parties, servants and stuffed shirts until you begin to wonder what on earth this has got to do with the cover. This portrays a female in loose robes holding a blue sword and sitting astride a horse which is anxiously keeping an eye on something by its legs, which looks like a cross between a dog, a leopard and ET.



That female, we learn much later on, is Harry. Though she is probably the last person to realise it, she has distant but powerful connections with the magical Hillfolk who dwell in Damar and it is not long (about three chapters) before the Hill-king, Colrath, abducts her – driven by forces which he only half understands. From then on the magic takes over and the real action begins with horses and swords figuring prominently (so the cover's OK after all).

But *The Blue Sword* contains many intense and often long-winded character analyses which slow the pace quite a bit and make it rather heavy going. Of course they give it substance but I think some of them could have been sacrificed in the interests of bedtime readers.

While I enjoyed the parts of it I read, I have to say that putting this book down was not difficult.

IW

Falcon 1: The Renegade Lord **by Mark Smith and Jamie Thomson. Pubished by Sphere at £1.75. Soft covers.**
The first in the Falcon range of four adventure game books in much the same style as Ian Livingstone's Fighting Fantasy series. It really beats me why these game books have suddenly taken off – they're certainly not a new idea. I remember having a similar sort of book back in the '60s based on the search for buried treasure. The new versions are much more complex, of course, but basically run along the same lines.

Nowadays you're trying to save mankind from destruction by stopping an evil Time Lord from meddling with the past. To help you, you're given quite a lot of background information plus a full explanation of the rules. A cardboard dice and a scoresheet are included in the book, so off you go.

While I realise the series is aimed primarily at children in the 8-14 bracket, I tend to bore of them rather quickly and usually end up cheating by flicking through the pages in the hunt for the correct solution. Mind you, I am the world's worst adventurer!

As you progress through the adventure you are given code letters which can then be equated to a rating. . .and there's the rub. You need to buy the second book in the series to check your rating because, according to the publishers, printing them in this book would allow you to discover the right decisions. Oh yeah? Sounds more like a smart marketing ploy to me.

PC

Elric at the End of Time **by Michael Moorcock. Published by Granada at £1.95. Soft covers.**
'Right', I thought, having just read *The Colour of Magic* and *Crewel Lye,* 'what I need now to get back into the swing of things is some serious fantasy.' And fantasy doesn't come more dour than Elric, doom-laden albino prince of Melniboné, right?

Wrong! I was surprised, though not unpleasantly, to find the story was written in Moorcock's more humorous style, with pirates that are really parrots or pierrots, becoming almost Pythonesque at one stage when Elric and one of the other characters indulge in the 'Yorkshiremen' sketch, each trying to outdo the other for bad experiences. Una Persson also features in this tale, in which the race is on for her to return Elric to his own plane before his presence at the End of Time shifts the cosmic balance and destroys the whole fabric of Time itself.

The book also includes another, more serious Elric story, together with some background information by the author about his writings and subjects, and a large number of short stories, building into one longer 'epic' about a character called Sojan the Swordsman. Although entertaining to read, they all seemed to end rather abruptly, almost as if Moorcock had an idea, started writing about it, and then lost interest.

On the whole, however, a good light read, and devotees of Moorcock's penmanship will doubtless be interested by the non-fiction items it contains.

CR

Banquets of the Black Widowers **by Isaac Asimov. Published by Granada at £8.95. Hard covers.**
The fourth book in Asimov's Black Widowers collection of mysteries which revolve around a group of six 'distinguished gentlemen' who get together in a restaurant once a month with a guest who has to justify his existence. The six, plus Henry the know-all waiter, have a talent for eliciting surprising revelations from their guest, usually in the form of an unsolved mystery or problem which they then set about solving.

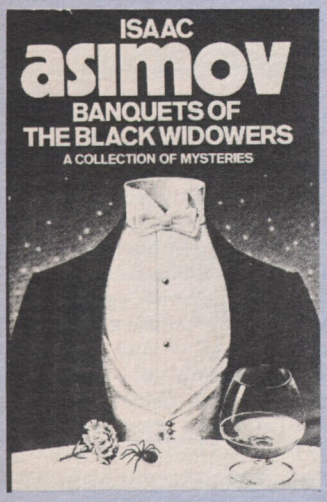
The stories remind me somewhat of those *Two-Minute Mysteries* which were so popular back in the '70s, but on a much more complicated scale. Most run to about 15 pages thanks to a good deal of padding with various humorous anecdotes from the gentlemen who seem to have experienced just about everything in the world there is to experience.

Many of the mysteries are ingeniously constructed and total-

READOUT

ly absorbing but the solutions, to my mind, were often equally as ludicrous. It's Henry the waiter who invariably solves the posers, and he really would make Sherlock Holmes look like Inspector Clouseau – he's such a bloody smartarse.

I just wish Asimov had aimed these stories at us mere mortals and let Henry get on with the important job of pouring the brandy. **PC**



***Labyrinth of Lies* by Adrian Berry. Published by The Book Guild at £7.50. Hard covers.**

This is the second Koyama novel by Adrian Berry, Science Correspondent for the *Daily Telegraph,* concerning the exploits of Ephraim Koyama, ruthless dictator of the Realm of Sarnos.

The first novel in what will presumably become a series, *Koyama's Diamond,* was highly acclaimed by the press and described as 'SF for the City columns'. I didn't read the first book but I certainly can't think of a better phrase to describe *Labyrinth of Lies.*

It's basically a thriller which happens to be set in the future, with obvious East v West connotations. Mr Berry's talents as a science correspondent in helping to popularise scientific issues are employed to the full in his fiction writing; this is an SF novel which can be enjoyed by anyone, be they an SF buff or not.

That being the case, it might not appeal to the ardent purist but there's no denying that *Labyrinth of Lies* is written with style, more than a little humour, and has a good basic plot which holds the reader right to the final page. *Labyrinth* takes over where *Koyama's Diamond* left off; Koyama, having gained control of the realm with lots of healthy backstabbing, now faces rebellion from the ice-bound planet Bowgrath. War would undoubtedly cause his government to fall; another dose of murder and intrigue is the only solution.

Who's to say, however, that Adrian Berry's vision of the future – ie economic, social and political upheaval – won't prove depressingly accurate? Perhaps there's more in here for the SF buff than I realised . . . **PC**

***The UFO Casebook* edited by Peter Brookesmith. Published by Orbis at £1.99. Soft covers.**

Nothing particularly new here in terms of content, revelations or solutions to the age-old mystery, but this compendium of some famous UFO sightings and encounters is very nicely presented and makes an interesting, if somewhat lightweight, read.

Most of the photographs included in the book have been seen many times before but a fresh approach are the colour pencil drawings which give the pages a light airy feel and enhance an otherwise rather mundane UFO book. Out of focus shots of dustbin lids and frisbees tend to become something of a bore after a time, don't you think?

Cases covered include the New Zealand TV film, the humanoids of Pascagoula, and the Brazilian 'sex with an alien' encounter. (Honest!)

Hardly comprehensive certainly not controversial, but good value at £1.99. **PC**

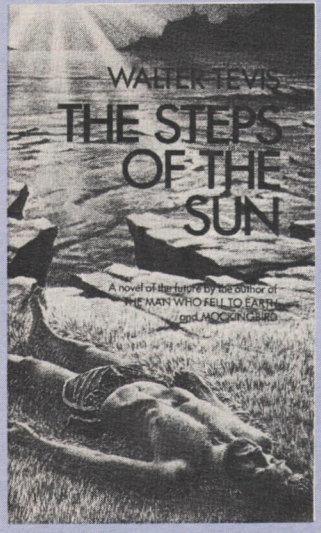
***The Steps Of The Sun* by Walter Tevis. Published by Corgi at £2.95. Soft covers.**

From the author of *The Man Who Fell To Earth* comes this example of SF at its very best. Tevis is not an author whose work I am familiar with, other than the movie version of the aforementioned book, so when Corgi sent this one for review it was very much an unknown quantity.

The scenario is familiar enough – the world's energy resources are all be depleted; Americans keep warm by burning wood, buses and trains run on coal, and electricity is an expensive commodity; skyscrapers have been abandoned due to the cost of running elevators; nuclear power has been banned; World control is practically in the hands of the Chinese. Against this austere setting, Ben Belson sets off to the stars, illegally, on a journey to find new mineral resources, and to contemplate his personal life.

The whole tale is recounted by Ben himself; few authors can sustain a first-person, present-tense narrative for much more than a short story without being in danger of losing the thread of their tale, but I can honestly say I have rarely read such a convincing or moving narrative as this one.

Writing at its best – and not just SF writing either. **AN**

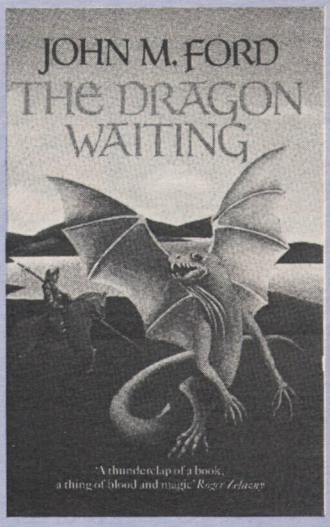


***The Dragon Waiting* by John M Ford. Published by Corgi at £3.50. Large format soft covers.**

Sort of historical fiction this one, with plenty of fantasy thrown in for such good measure that at times I got thoroughly tangled up.

The Dragon Waiting is set at the time of Richard III, and tells of one group of special people and their influence on history. At the same time we're given a most unusual solution to that old mystery of what happened to the Princes in the Tower, and a new insight into how they fought battles in those days.

This is one of those books upon which it is hard for me to pronounce. You'll either love it or detest it, not because of the writing style, but because of the subject matter. I liked the style, I loved the ingenuity of the story, and overall I enjoyed the book considerably. **WG**



***Sundiver* by David Brin. Published by Bantam at £1.95. Soft covers.**

Brin's first novel contains just about everything that the modern reader of SF is likely to want from a book. There are intelligent, well-conceived aliens, a very human hero, and an abundance of scientific ideas, all moulded together to form a first-rate action story.

Niven was one of the first authors to get to grips with what we have come to know as hard-core SF, and many authors have jumped on the bandwagon since then. Brin is rapidly establishing

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himself as one of the better examples of this new breed. His more recent novel, *Startide Rising* has already won both major SF awards, the Hugo and Nebula. *Sundiver* doesn't take place on such a grand scale but is no less an excellent book for that. The early chapters are a little slow, but once all the major characters have been introduced, and the plot allowed to unfold, the action moves along at a nice, comfortable pace.

Put simply, the book follows the Sundiver Expedition in its search for the Patrons of the human race, the mythical creatures who began our uplifting from being primitive apes millenia ago, only to abandon us to our own fate. All of the other main galactic races still have their Patrons, and humans are regarded with a mixture of interest and amusement for having been abandoned long ago.

The plot is a good one, being both original and believable, and the author's characterisations are excellent, as is the scientific background. It is quite rare for a hard-core SF novel to incorporate such first class characters within its make-up, but Brin has succeeded admirably. **AN**

***Earth Abides* by George R Stewart. Published by Black Swan at £3.95. Soft covers.**

Black Swan is a Corgi imprint, and all the books in this series are of trade paperback format, but with a quality of paper and printing far more akin to an expensive hardback. SF works in the series are few and far between, so when an SF novel is published under the Black Swan imprint it has to meet very strict literary standards.

Earth Abides is quite simply a classic of the SF genre. Stewart was ranked alongside Huxley, Orwell and Wells when this novel was first published in 1949, while he was Professor of English at the University of California.

The tale is one of the struggles to survive after a killer virus has wiped out practically the whole human race. Nothing new about that, but Stewart handles the whole scenario in such a mature, controlled and intelligent manner that it is little wonder this work was, and is, held in such high esteem.

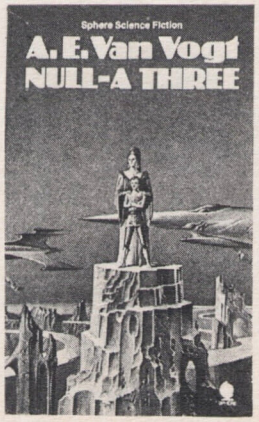
It's not easy reviewing a genuine classic of which so many compliments have been paid in the past. I can only add to the long list of superlatives and say that it should find a place on every SF fan's bookshelf. **AN**

***Null-A Three* by A E Van Vogt. Published by Sphere at £1.95. Soft covers.**

One of the troubles with book reviewing is that publishers have the knack of sending you things that should never see the light of day, let alone go on sale to the general public. This, unfortunately, is such a case.

To be honest, Van Vogt has never figured on my reading lists, so I approached this novel with great trepidation. After all, Van Vogt is reputed to be one of the great masters of the genre. Frankly, I was amazed at the sheer awfulness of *Null-A Three*. Considering the main character is supposed to be a superhuman capable of amazing mental gymnastics, he gets into some pretty ridiculous situations, and generally comes across as being a superdrip.

Van Vogt's actual structuring of the novel leaves much to be desired, too, with the first half of the book covering events which take place in the space of a couple of hours. In fact, I can't find anything at all to recommend this book, unless it is taken as an example of how NOT to write SF. If you like 'Doc' Smith you'll probably enjoy this. I didn't. **AN**



***The Sentinel* by Arthur C Clarke. Published by Granada at £2.95. Large format soft covers.**

This collection of nine short stories by Arthur C includes, as the overall title suggests, the story which sparked off 2001 *et al*, so it is of interest to all SF fans, for whom the author must be one of the 'gods'. For your money you also get a few pages of autobiographical chat, and what seems to be a non-existant section at the back where page 301 is indexed as 'contributors' and is a blank page! Am I missing something significant here?

Each story is prefaced by a page or so of introduction – very much in the style of Isaac Asimov, who can never resist having a chat with his readers. Nevertheless, it is an interesting collection, and, for newcomers to SF, a splendid way of getting hold of some of the best short stories by an acknowledged master of the genre. **WG**

***The Zap Gun* by Philip K Dick. Published by Granada at £1.95. Soft covers**

Still the Granada reprints of Dick's novels continue! *The Zap Gun* is set in the 21st Century, and the arms race between East and West has taken on an almost lunatic approach to maintaining world peace. The plot unbalances the arms race by bringing in an extra terrestrial menace that is intent on taking over the world.

Pure space opera, admittedly, but with a difference. This is one of Dick's more humourous works and, while not an outright comedy, it has a rich sense of wit and satire. The author examines how naive the struggles of man can be in the face of an absurd and menacing universe, yet the twist is that even a naive approach to problems can be successful in the long run.

I found the book easy to get into, and noted many of Dick's favourite themes running throughout the story. His interest in the problems of ordinary and not-so-ordinary people is something I feel other authors would do well to note.

Another novel that can only serve to enhance Dick's reputation as one of the most original authors the genre has known. **AN**

***In Search Of Schrodinger's Cat* by John Gribbin. Published by Corgi at £2.95. Soft covers.**

Quantum Theory has been with us for several decades, but only recently has it permeated down to the general public. John Gribbin's latest book takes a look at the evolution of Quantum Theory, beginning in the days of Newton and Fresnel, and moving right up-to-date with all the latest interpretations of reality and the cosmos.

That the author manages to impart large quantities of information to the reader without seeming to lecture or talk down says a lot for this book. So many scientific accounts turn out to be dry, weighty tomes, yet this one avoids all the pitfalls and stands up for itself. I had a vague understanding of Quantum Theory before reading it, but I was certainly a great deal wiser by the end. I find myself wishing that Isaac Asimov's factual works were as good, then I could understand what all the fuss was about.

Thoroughly recommended to any reader with an interest in the workings of the universe. **AN**

***The Garbage Chronicles* by Brian Herbert. Published by WH Allen at £9.95. Hardback.**

I liked this. It was funny, and has an inventive plot of a future world where the problems of the economy have been solved by banning anything secondhand. Anything faulty or damaged or otherwise not perfect is shot into space as trash. To mend, repair or re-cycle anything is a huge crime.

Our hero gets the job of tracking down someone who has been collecting rubbish on another planet. There's some magic thrown into the story and a lot of fun, with said hero having a baby comet as a pet.

The author is the son of Frank 'Dune' Herbert, and Rog Peyton will doubtless love this book, as one item of the re-cycled trash depicted on the dust cover is an Andromeda bookshop catalogue... Mind you, is an Andromeda catalogue ever trash...? **WG**

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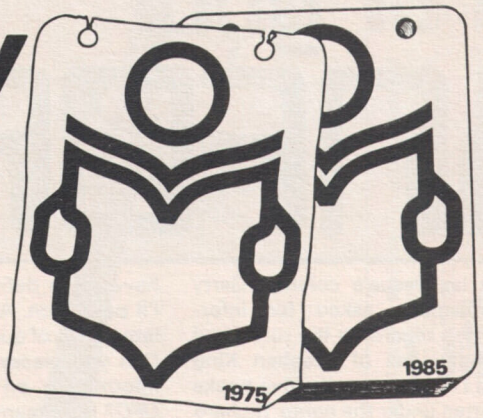

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For your INFORMATION

ROG PEYTON ANSWERS SOME MORE OF YOUR QUESTIONS ON SF AND FANTASY BOOKS.

In last issue's column, Gerry Musgrave asked for information regarding the rumoured pseudonyms of Stephen King and I reported on the five books written under the name 'Richard Bachman'. The fifth Bachman book, *Thinner,* has just been published over here in the UK by New English Library in hardcover at £9.95. Other rumours are circulating including a report of a book published in Germany by 'Stephen Marlowe'. The book actually states that it is Stephen King writing under a pseudonym though friends in publishing houses in Britain have checked this out and it simply *is not true* – just a publisher's ploy to sell more books by an unknown author, it would seem.

Another rumour currently circulating is that Stephen King has written two straight science fiction novels – apparently published in the mid-'70s by a small US paperback house. Judging by the strength of this rumour, its sources, etc, I would guess that there could be some truth in this. At this time I don't have any information as to what these books were or even if they were both published using the same pseudonym, but as soon as I have some definite information I'll pass it on. And so on to the latest crop of questions:-

Can you please give me some information on the TV series *UFO*? How many episodes were there, how many seasons, who were the regular characters and who played them?

Ian Fishwick
Bury

This was actually part of the same letter as the one asking about Star Trek *in the last column. I couldn't answer this part at the time but now, thanks to Steve 'Joe 90' Hatton, I have the info you require. Apparently there was only one season of this series (1969/70) that comprised 26 episodes, created by Gerry and Sylvia Anderson with producer Reg Hill. All were produced in colour and ran to 50 min per episode. The main characters were Commander Ed Straker (played by Ed Bishop), Colonel Paul Foster (Michael Billington), Lt Gay Ellis (*Crossroads *queen, Gabrielle Drake), Captain Peter Carlin (Peter Gordeno), Alec Freeman (George Sewell), Virginia Lake (Wanda Ventham). Critics at the time remarked that the actors were chosen for their resemblance to puppets, excellent make-up reinforcing the effect, though I can't quite understand why anyone would want to make Gabrielle Drake or Wanda Ventham look like puppets! I'd pull their strings anytime.*

Two paperbacks of the series appeared – UFO *and* UFO 2, *both by Robert Miall and published by Pan Books.*

I remember reading, when much younger, a short story called (I think) *Mr Mergenthwerker's Lobblies.* Could you tell me (a) who wrote it, and (b) where could I find it?

Richard Grey
London

Mr Mergenthwirker's Lobblies *was written by Nelson S Bond and first appeared in* Scribner's Magazine (USA) *in November 1937. It concerns a gentleman who acquires the companionship of two invisible beings who foretell the future. There were a number of reprintings and it became the title of a radio series, later being expanded into a play. It was published in* Mr Mergenthwirker's Lobblies and Other Fantastic Tales *by Nelson S Bond and published by Coward-McCann, New York, 1946 and also in an 85pg paperback by S French, New York, in the late-1940s (title story only).*

Three other stories of the Lobblies appeared – Tell Me About Tomorrow *(*Argosy *13 Dec 1941),* Miracles Made Easy *(*Argosy *15 Apr 1942) and* Don't Fool With Phantoms *(*Argosy *Dec 1942). None of these were included in the 1946 Coward-McCann book and don't appear to have been reprinted at all.*

As to where you'd find these stories now, I'm afraid I can't help you. Looking for the above-mentioned original magazines would prove difficult – and expensive. All the specialised SF/fantasy reference books indicate that the original story hasn't been reprinted since the 1940s though I strongly suspect the story has appeared outside the specialised field considerably more recently. I'd be extremely grateful if anyone could supply additional information on this one.

Keep those questions rolling in – I'll do my best to answer anything on the SF/fantasy genres. Send them to me c/o Space Voyager, 1 Golden Square, London W1R 3AB.

NEXT ISSUE

Science Fiction
In response to overwhelming demands in our reader survey, we hope to present the first of our sci-fi short stories in the next issue. Can't tell you much else at the moment but we're sure that this will become a regular and interesting aspect of **Space Voyager** in the future. The stories will also be illustrated by some up-and-coming talent from the world of SF art.

Astronomy in Canada
Dr John Davies travels the world in his search for the best observatories and has recently returned from a trip to Canada. Following his look at work in Japan, he now considers astronomical study and research in the second biggest country in the world.

Project Gemini Revisited
The second in our series looking at some of the great historical space missions of the past. Terry Bunting considers Project Gemini in retrospect – the mission which paved the way for the Apollo Moon landings.

Harlan Ellison
Neil Gaiman talks to one of the great SF writers of modern times, Harlan Ellison. After a recent layoff, he is now writing again and we can look forward to more great work from the man who has been described as 'the most brilliant, bizarre and controversial writer in science fiction'.

Black Holes
Probably the most controversial phenomenum in space, Aldo Rabaiotti considers how our understanding of Black Holes has developed over the years and presents some interesting new theories of his own.

Plus . . .
All our regular features – Shuttle Update, Night Sky, Viewscreen, Patrick Moore, Read Out, For Your Information and Data Bank and lots more besides. **Space Voyager 18** will be on sale 8 November.

If you have any problems getting your copy of **Space Voyager,** please let us know and we'll do our best to sort them out.

Next issue contents are correct at the time of going to press but are subject to revision and alteration at the Editor's discretion.

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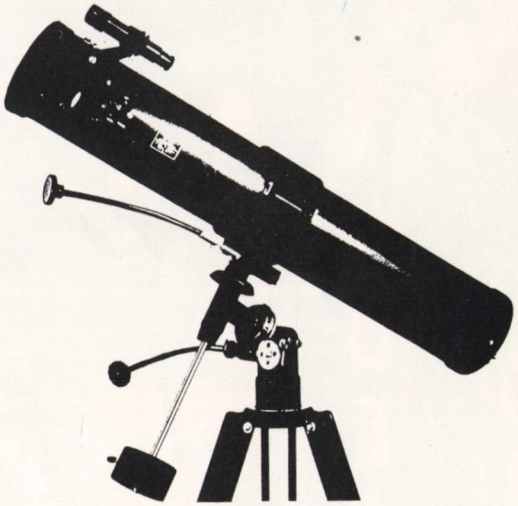

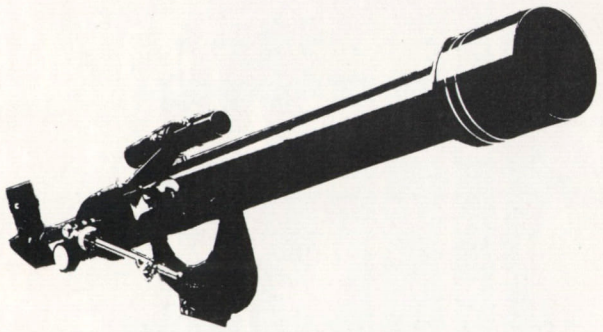

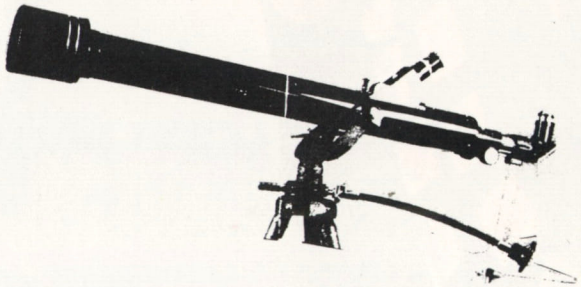

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